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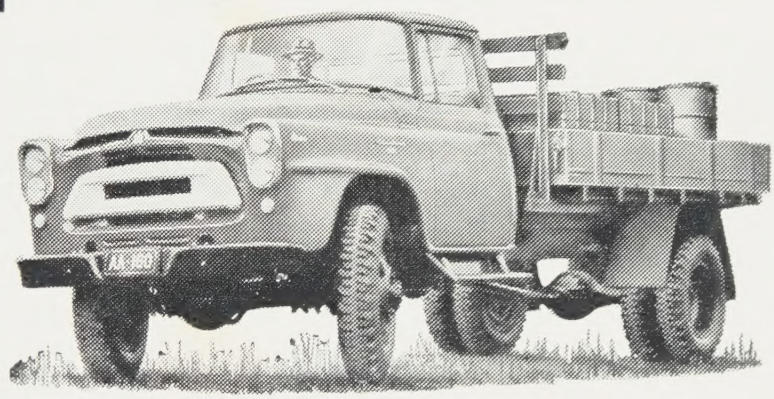

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The South Pacific Commission

The South Pacific Commission is an advisory and consultative body set up in 1947 by the six Governments responsible for the administration of island territories in the South Pacific region (Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America).

The Commission's purpose is to advise the participating Governments on ways of improving the well-being of the people of the Pacific island territories. It is concerned with health, economic and social matters. Its headquarters are at Nouméa, New Caledonia.

The Commission consists of not more than twelve Commissioners, two from each Government. It normally holds one Session each year. There are two auxiliary bodies, the Research Council and the South Pacific Conference.

There is a Research Council meeting once a year. This may be either a meeting of the full Council, or of one or other of its three main sections, specializing in the fields of health, economic development and social development. Members of the Research Council are appointed by the Commission. They are selected for their special knowledge of the questions with which the Commission is concerned, and the problems of the territories in these fields. The chief function of the Research Council is to advise the Commission on what investigations are necessary. Arrangements to carry out those that are approved are the responsibility of the Secretary-General and other principal officers.

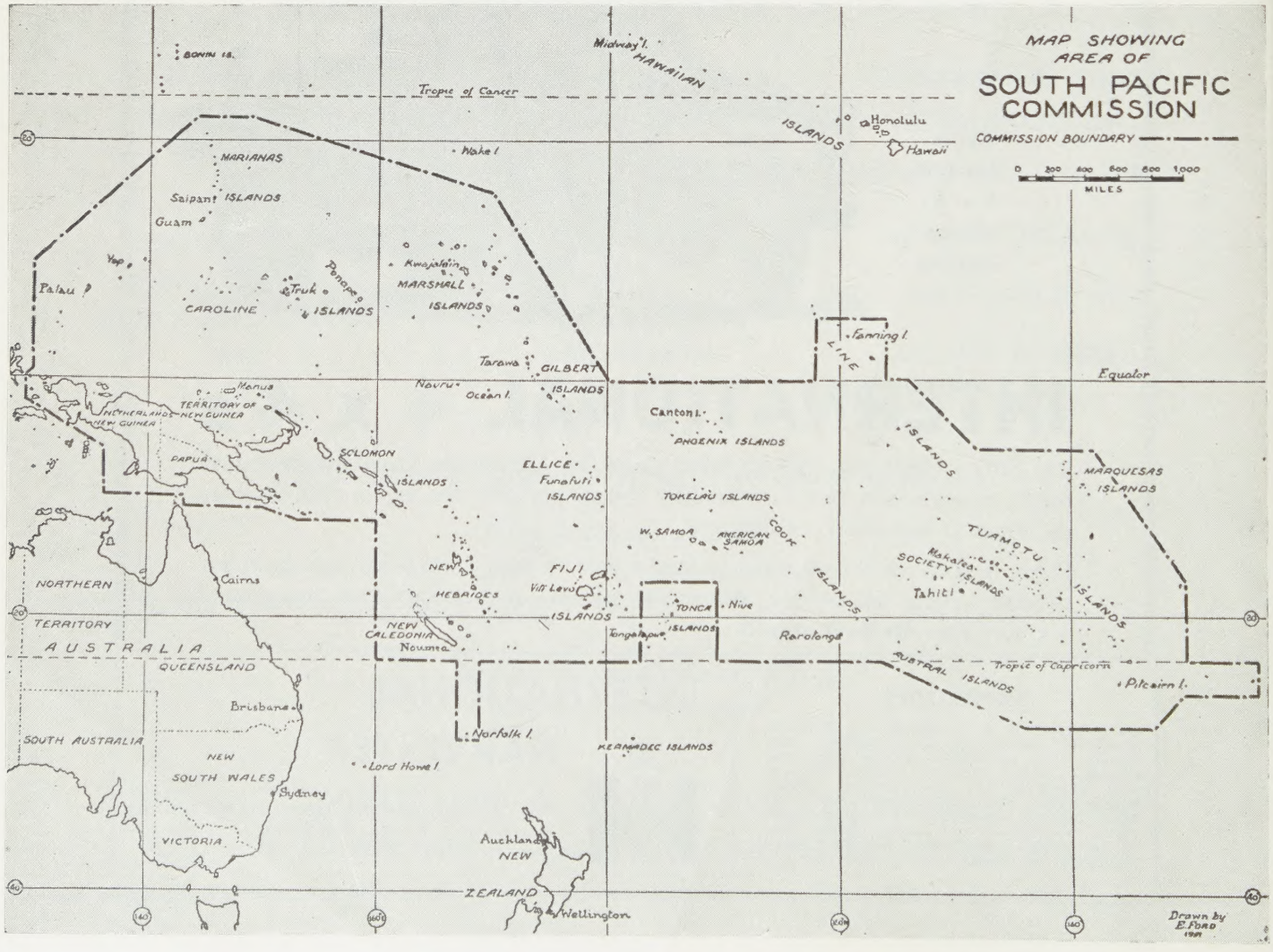
The South Pacific Conference, which meets at intervals not exceeding three years, consists of delegates from the local inhabitants of the territories, who may be accompanied by advisers. The first Conference was held in Fiji in April 1950, and was attended by delegates from fifteen territories and from the Kingdom of Tonga. The second Conference was held at Commission headquarters in April 1953. The third Conference was held in Fiji in April-May 1956, and the fourth Conference in New Britain in April-May 1959.

The principal officers of the Commission are: Secretary-General, Mr. T. R. Smith; Executive Officer for Health (Acting), Dr. T. C. Lonie; Executive Officer for Economic Development, Dr. A. H. J. Kroon; Executive Officer for Social Development, Dr. Richard Seddon. The powers and functions of the Deputy Chairman, Research Council, are exercised by the Secretary-General.

Further particulars of the Commission's activities may be obtained from the Secretary-General, Nouméa, New Caledonia.

FRONT COVER PHOTOGRAPH

Seed coconuts in a nursery plot on Waigani plantation in the Milne Bay district of Eastern Papua. A seed nursery is maintained for the replacement of palms killed by lightning and those which fail due to other causes. This plantation is owned by the British New Guinea Development Company and has 1,200 acres of mature palms. Approximately half this acreage is interplanted with cocoa.



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EDITOR: *A. E. Read, B.Sc.*

THE SPC QUARTERLY BULLETIN, first published in January, 1951, features articles on selected activities in the Commission's three main fields of operation: economic development, health and social development. Articles are also contributed by specialists working in these and related fields, in the territories within the Commission area.

THE BULLETIN is given selective world distribution to people and institutions in widely differing fields sharing a common interest in the purposes and work of the Commission. It is published in two editions, English and French.

SUBSCRIPTIONS and orders for single copies should be directed to: South Pacific Commission, Box 5254, G.P.O., Sydney, Australia. Subscription rates are given in the Table below.

ALL OTHER ENQUIRIES relating to the SPC QUARTERLY BULLETIN should be directed to. The Editor, South Pacific Commission, Nouméa, New Caledonia.

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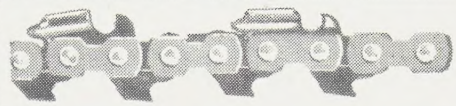

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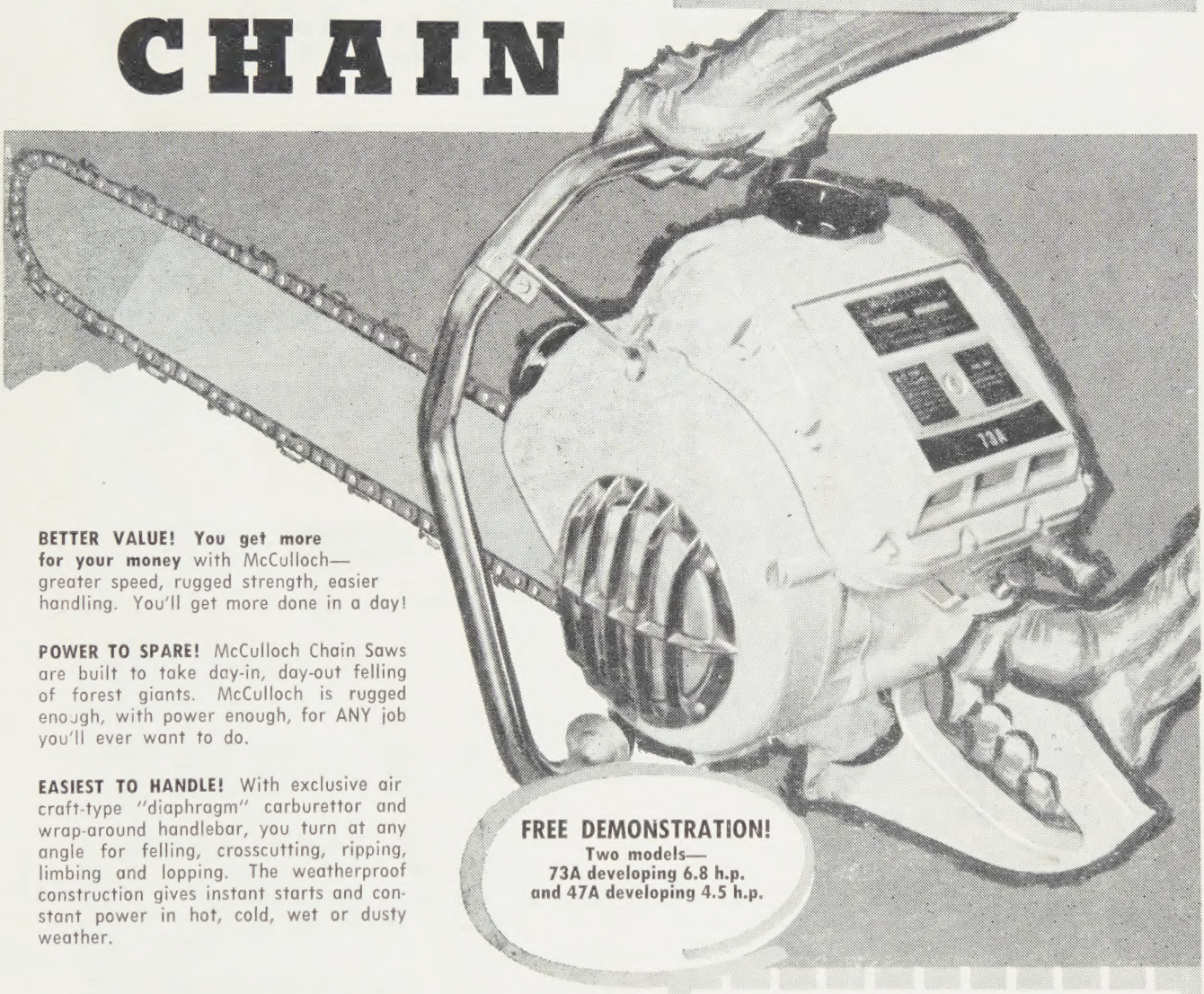

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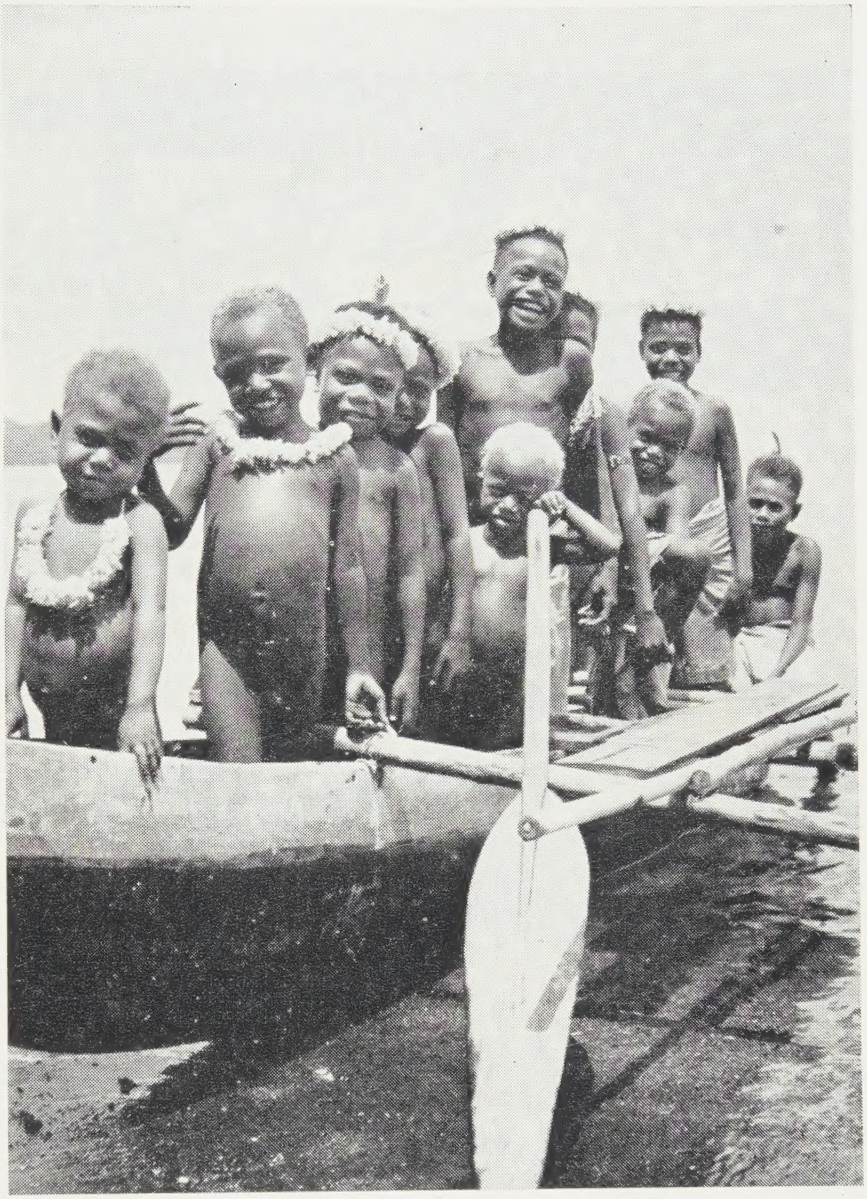

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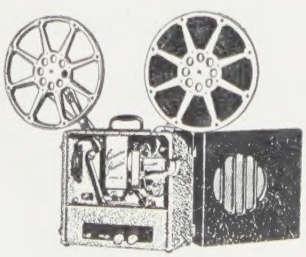

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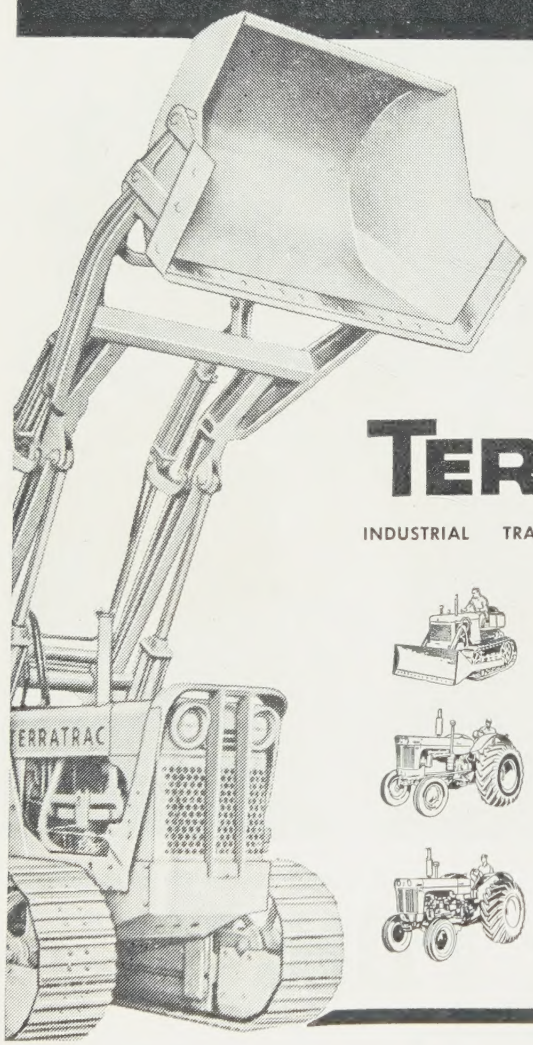

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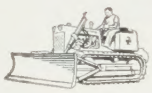

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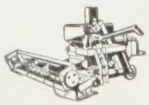

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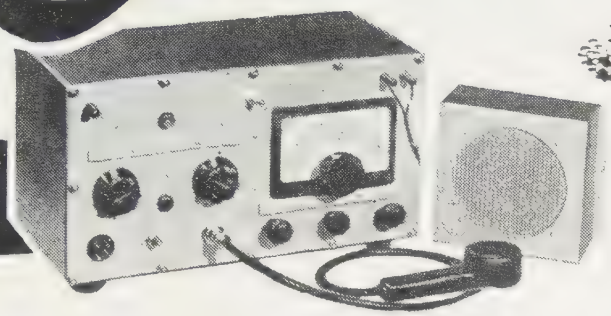

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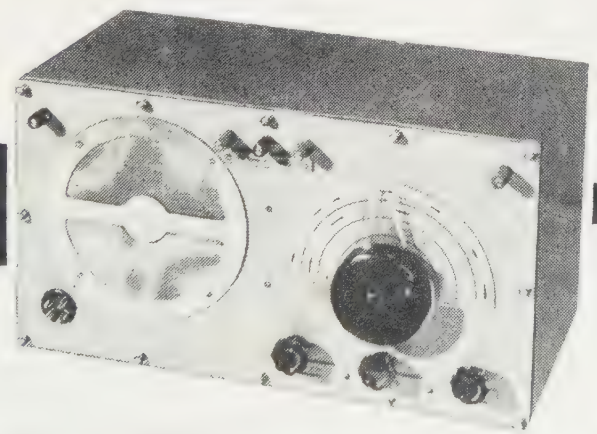

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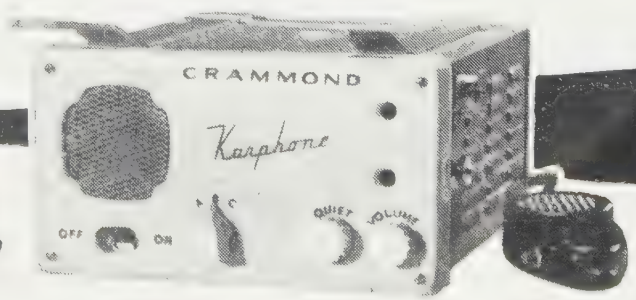

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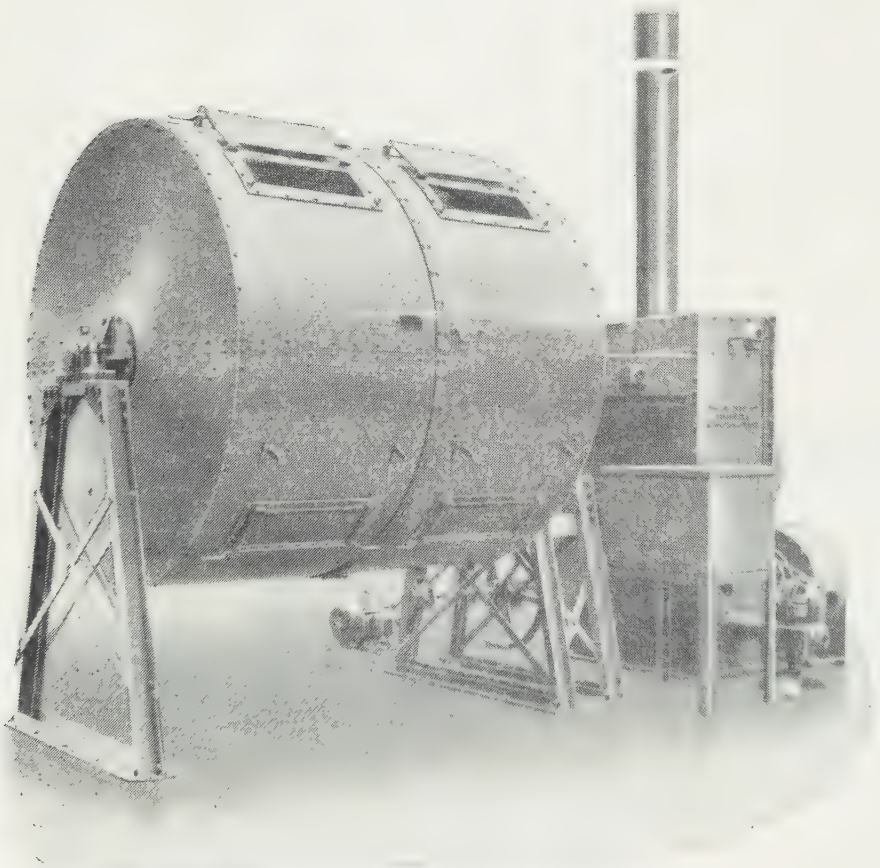

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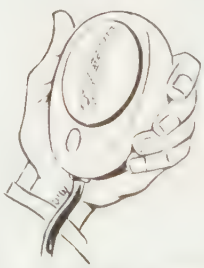

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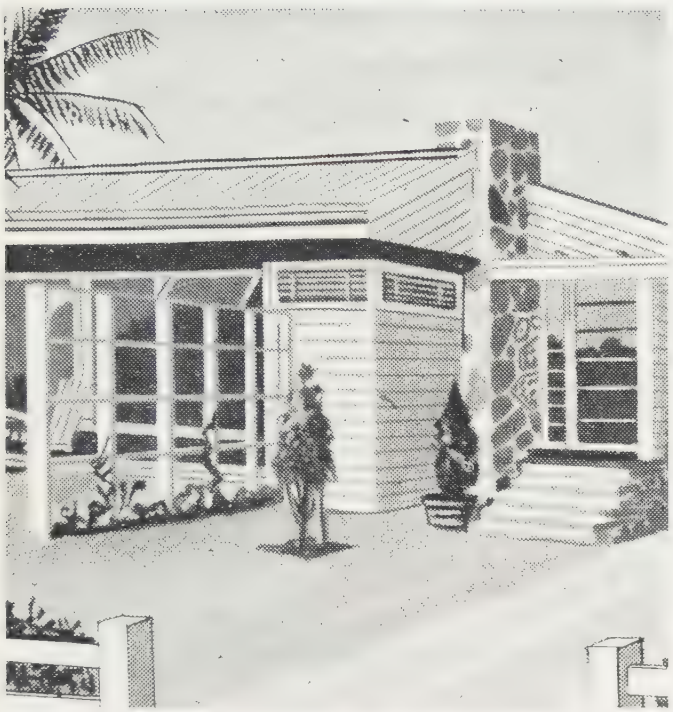

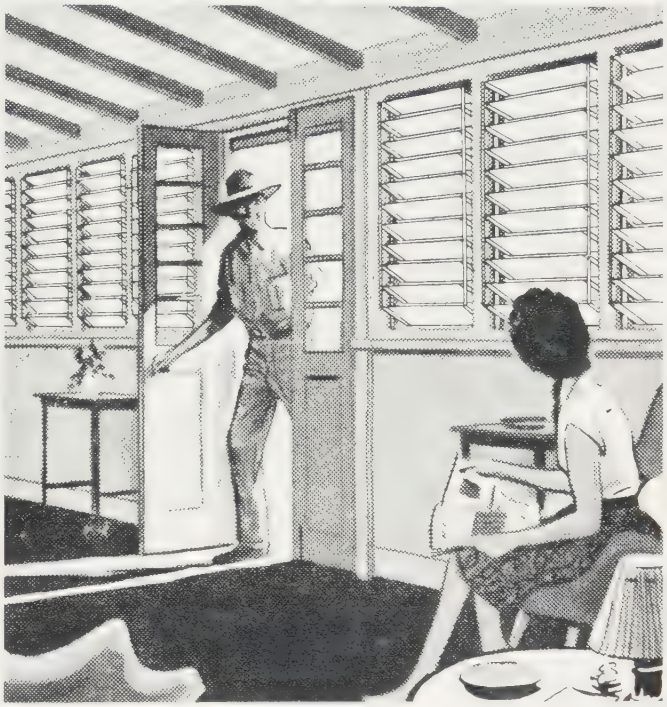

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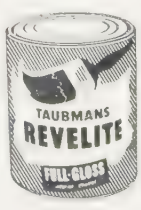

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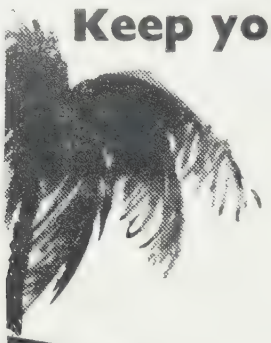

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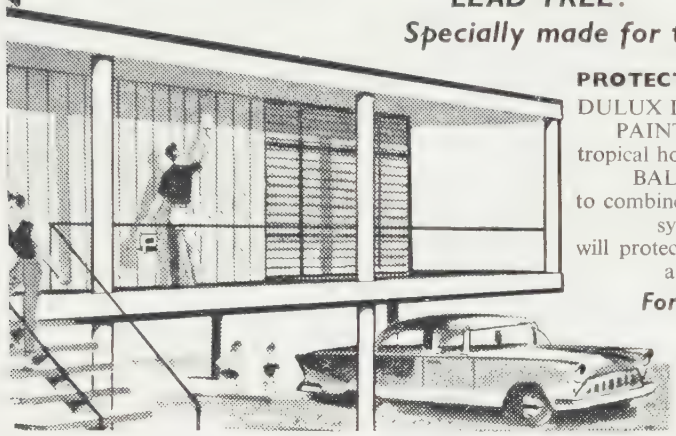

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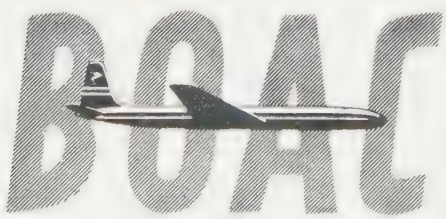

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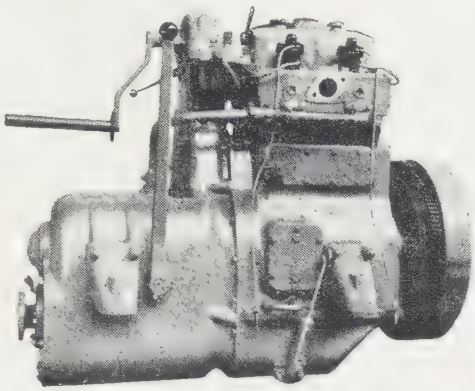

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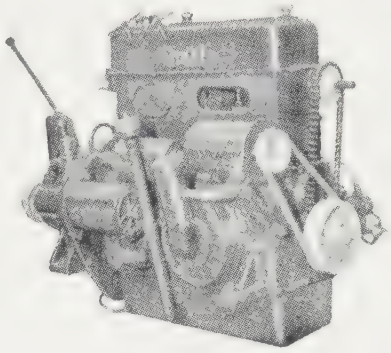

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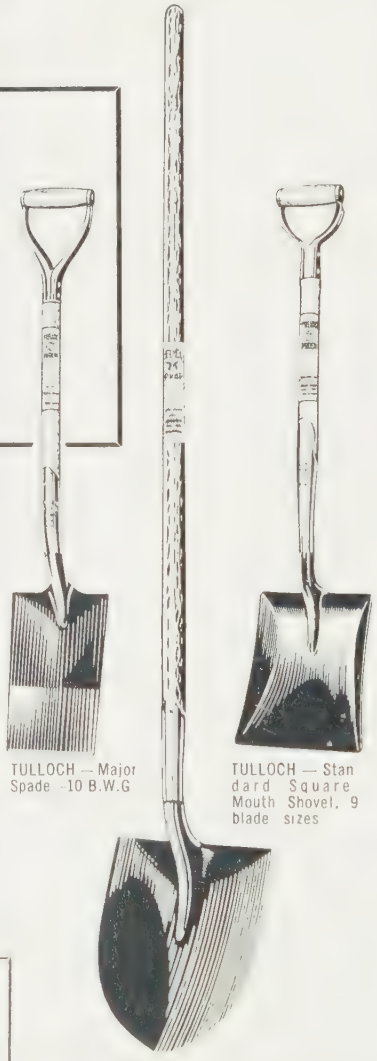

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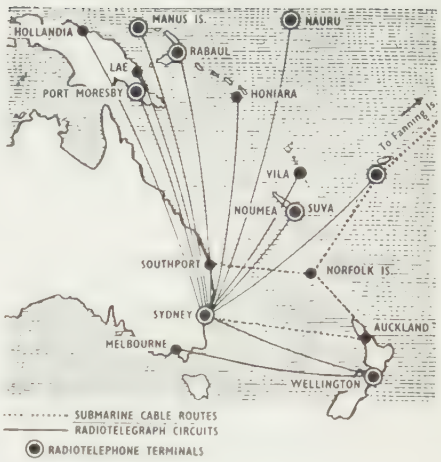

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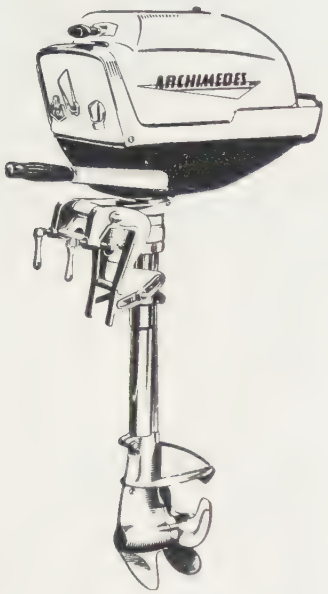

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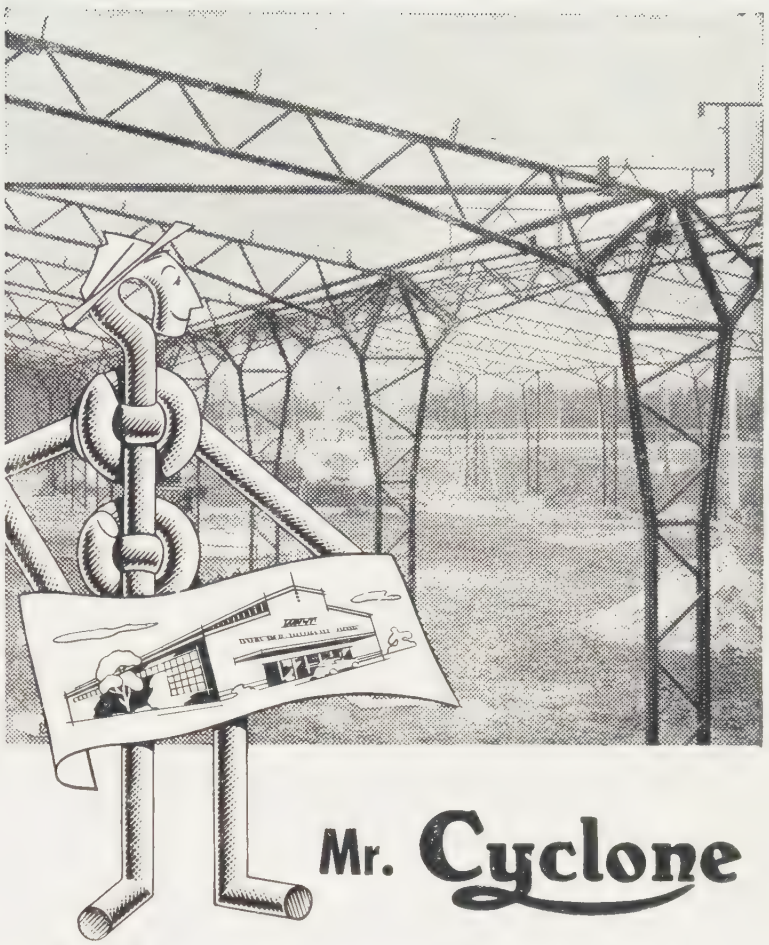

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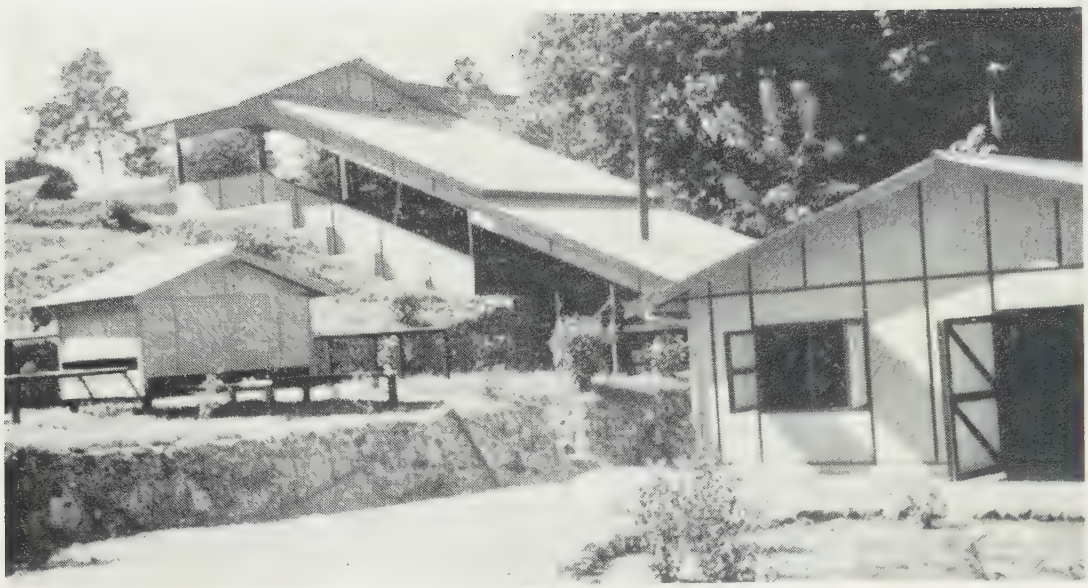


The cocoa-bean processing plant at Auki. The hillside fermentary can be seen. Constructed in five steps, it reduces labour costs by using gravity to transfer the cocoa beans daily from higher to lower fermenting boxes, turning and aerating them in one movement.

Bright Prospects For Cocoa Industry In The Solomons

Prospects are promising for the young cocoa industry recently established in the British Solomon Islands Protectorate, according to the author of this article. He pays high tribute to the work of the Cocoa Division of the territory's Department of Agriculture.

By D. R. A. EDEN*

SOME years before the turn of the century a lone native paddled his canoe from the Island of Fernando Po to the African mainland.

In his dugout, carefully packed in plantain leaves, lay a basket of cocoa pods. After wading ashore with his precious cargo he carried the basket for hundreds of miles until he came to the village where his family lived. On the family land he planted the cocoa, and thus unwittingly became the precursor of the vast cocoa industry of the Gold Coast.

Today, on the island of Malaita, in the British Solomon Islands Protectorate, visitors may witness the birth of a new cocoa industry which has been launched under the supervision of the Cocoa Division of the Department of Agriculture.

Perhaps the greatest initial impetus to the establishment of a cocoa industry in the Solomon Islands was provided in 1951 by the Resident Commissioner, Mr. H. G. Gregory-Smith, when he invited Mr. D. H. Urquhart to visit the Group to assess the prospects of growing cocoa there.

On some of the larger islands, small pre-war plantings of cocoa had survived to prove the hardiness of the plant and the suitability of the climate.

During his visit Urquhart recorded his observation of survivals on Ysabel, Malaita, Rendova and Russell Islands. On Malaita, in the hills behind Auki, he was shown trees which "were healthy, in bearing and quite well grown".

Recommendations on *The Prospect of the Growing of Cocoa in the British Solomon Islands* were published in 1951 by Messrs. Cadbury Brothers of Bournville. In this booklet Urquhart maintained that while the soil suitability for a crop as yet untried in a new area could only be carried out by a soil scientist, the final test must be a field trial with the actual crop.

Bearing in mind that Malaita is one of the most fertile islands in the Solomon Group and contains by far the greater proportion of Melanesian inhabitants, the Department of Agriculture selected land there for its cocoa experiments and first demonstration plots.

After soil samples had been submitted for analysis and assessment a number of sites were chosen, and pilot projects of cocoa plantings were begun in 1954 and repeated towards the end of 1956.

Progress in the early stages was hampered by a lack of experienced men. It was not until early in 1958 that the development of cocoa as a new crop gained momentum with the arrival from Africa of an experienced cocoa officer. Plans for the extension of field trials were approved and financial assistance obtained through the Colonial Development and Welfare Fund.

Although the cocoa industry of the Gold Coast has brought billions in money to its inhabitants, the uncontrolled nature of its establishment led to the adoption of uneconomic principles of farming and eventually to the disaster of the virus disease, swollen shoot. For years the disease ran unchecked, since it was then nobody's business to interfere with the native farmers, and it was not until the whole industry was threatened with extinction that pleas for control of the monstrous disease brought in Government assistance.

Taking a lesson from this example of uncontrolled farming, the Department of Agriculture in the British Solomon Islands Protectorate decided that it would, by example, set a precedent of correct planting and cocoa husbandry. It would also take precautions to prevent the spread of diseases and to diagnose and endeavour to eradicate such diseases before

* Mr. Eden, who for many years was Manager of the New Zealand Reparation Estates in Western Samoa, last year accepted appointment as Manager of the British Solomon Islands Trading Corporation, with headquarters at Honiara.

Above: In the propagating house, the Principal Cocoa Officer (Mr. R. A. Keevil) explains the techniques of green stick and leaf propagation of cocoa. Right: Under the new system of bush shade control, thriving young cocoa seedlings are assured of an ideal percentage of sunlight and shade.

they achieved epidemic proportions, if and when they occur.

Cocoa Division Headquarters On Malaita

I was afforded an opportunity for seeing over the Division's headquarters at Auki, where introductory gardens have been laid out to test imported clones for suitability in their new environment.

Equipment for vegetative propagation is already installed, and this will be used to produce rooted cuttings and to supply them in large quantities for planting out on native farms. Extension officers will be on hand to advise the smallholder as to the correct methods of shade control, lining out, spacing and planting.

At the headquarters, too, a complete processing plant has been erected in readiness to demonstrate modern methods of fermenting, drying, washing and grading the cocoa beans, and for reconditioning, where necessary, any subquality parcels of beans from smallholdings which may have to be temporarily withheld from export.

At present, most of the good cocoa harvested is being purchased by the Division as planting material. After purchase from the native growers, the pods are opened and the cocoa beans are selected for viability by a unique method of "floating out", as it is called.

The selected beans are then grown in nurseries, and finally distributed in bare root form to neighbouring Melanesian farmers for planting out when the seedlings are about four months old.

Floating-Out Test For Viability

The floating-out test was introduced by the Cocoa Officer, Mr. R. A. Keevil. He has demonstrated that viable cocoa beans sink when immersed in water, while those which float are malformed and are not viable.

Keevil proved that of every 100 beans which sank in water, ninety-three per cent germinated, while similar tests with those which floated gave only a one per cent germination.

This is attributable to malformation by the destructive effect of insect, fungus or bacterial invasion of the cotyledons. When the floating beans are cut open they are invariably found to possess a gap or opening between the cotyledons. This deformity apparently forms an air pocket inside the testa, which causes the beans to float. The beans which sink have normal, closely-knit cotyledons.

Cutting Beans To Accelerate Root Development

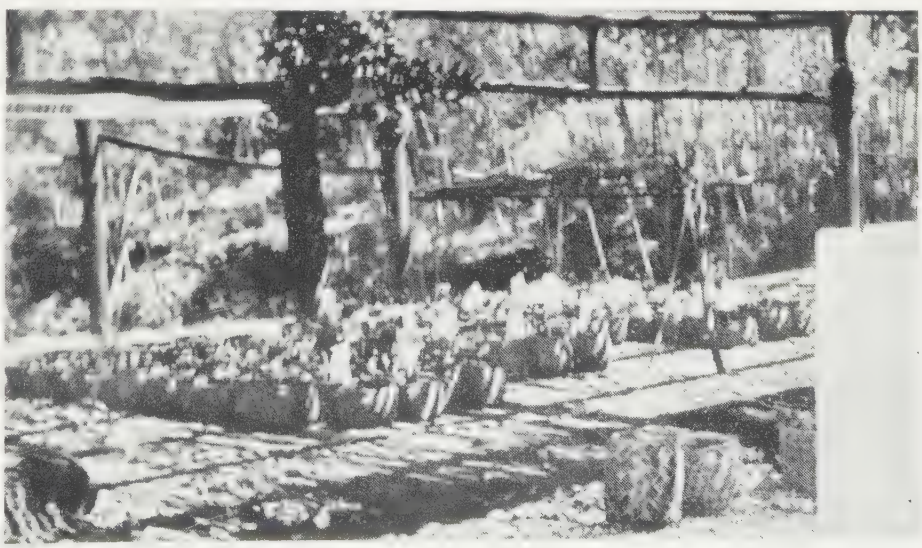
Another interesting departure from common planting practice was demonstrated to me at Auki. A system of cutting off about a third of a cocoa bean's length before planting has been adopted with obvious success.

The bean is sliced across at the apex end, that is, at the tapering point away from the wider, or embryo, end. This trimming of the bean at planting, far from decreasing its germinating faculty and subsequent growth as may be supposed, leads to a more vigorous development of the seedling after its first few weeks above ground. Comparison with seedlings developed from whole beans leaves no room for doubt as to the efficacy of the cutting process.

No good reason for the accelerated growth was advanced, but I suppose that the seedling rootlets have earlier responsibilities for seeking nourishment for the plant thrust upon them, and respond accordingly.

The slicing of the bean is also helpful to planters who wish to see the colour of the beans they are planting and perhaps select towards uniformity on their plantations. They could select the purple beans of the Forastero or the white beans of the Criollo.

The hybrid cocoa of the Pacific region



A corner of the bush house where rooted cuttings of cocoa are placed for hardening before being planted out on the native farms.

Above: Melanesian farmers from the Western Solomons attend lectures on cocoa planting at the Auki demonstration blocks. Right: The Principal Cocoa Officer with his extension officers attend a meeting with visiting Melanesian farmers from the Western Solomons.

has a wide colour range in almost every pod, from pure white through the mauves to a deep purple. When the cotyledon colour is revealed by the slicing method, a planter would be in a position to select his fancy, choosing one colour and rejecting the others. He could thus ensure a predominance of Forastero or Criollo characteristics as desired.

Shade Control In The Demonstration Blocks

Throughout the Pacific region where cocoa is planted, it is common practice to clear the bush and plant legumes to give shade to the cocoa and to provide a continuing supply of nitrogen for its well-being.

It has been demonstrated by scientific experiment that when ground temperatures under shade in the tropics are not allowed to rise above 65 degrees F., there is little loss of soil nutrients and the nitrogen supply remains more or less constant, as in virgin bush land.

Conversely, when land is exposed for long periods to direct tropical sunlight, a leaching process is promoted; soil nutrients are dissipated and the essential balance of nitrogen is jeopardized.

At the Cocoa Division's demonstration blocks, this principle of shade control to maintain fertility has been exploited. The natural forest is used as overhead shade for growing cocoa, and the results have already proved its value.

The forest shade is controlled by using three layers of cover, called dominant, intermediate and nurse.

The dominant layer is comprised of the native forest giants which rise in some cases to as high as a hundred feet above the ground. Only five or six of these big trees are allowed to remain to the acre.

The dominants are first selected by careful examination. Those which appear likely to fall in a high wind, and those which may be damaged or infected with fungi, are rejected and felled. These are then cut up and allowed to lie and rot away, but never burned. All the plant nutrients in the rotting material are thus returned to the soil.

A selection of the remaining sound dominant trees is next undertaken for suitability as to spread and foliage, and, of course, for compatibility with cocoa.

Those chosen are usually the small, light-green leaved varieties which form a delicate sky silhouette as opposed to those with larger leaves and dark-green foliage, possessing heavy, more solid canopies.

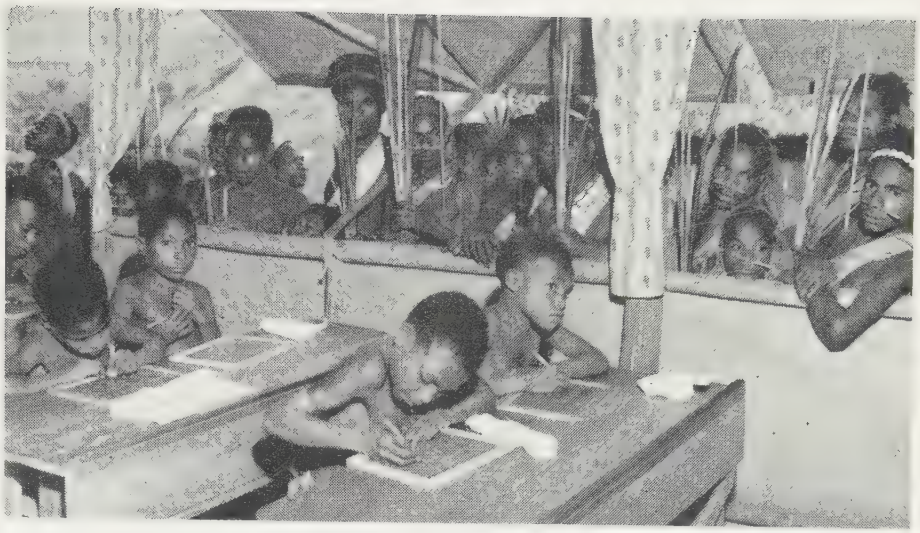
Care is taken to see that the canopies of the final selections do not meet, but that patches of clear sky remain between the high tree crowns. A measure of full sunlight must be allowed to penetrate to the second and third layers of protective foliage. Random distances separate the dominants.

The second or intermediate shade layer is next given attention. This comprises saplings which may be identical with some of the varieties used in the dominant layer, but are younger and shorter. Those whose heights range between twenty and thirty feet are chosen, and, generally speaking, the intermediate layer is restricted to approximately thirty trees to the acre.

Compatibility between native trees in an unknown forest and cocoa can only be determined by trial. Observation of the underplanted cocoa seedlings will reveal in some cases a halted development. Other factors being equal, this may be attributed to an adjacent incompatible. When discovered, the undesirable bush tree should be removed and substituted with a legume or other fast-growing alternative. The Department is substituting with Queensland cedar and African mahogany transplanted from nurseries. When the industry has been

(Continued on page 36)

An agricultural assistant at Auki greets a visiting farmer from another island in the Solomons.



The beginning. Kukukuku fighting men of the New Guinea highlands watch their sons begin their education in a classroom of the Lutheran Mission School at Menyamya.

SPC Education Seminar Next Month

An education seminar for the South Pacific will be held under Commission auspices in Brisbane from November 16-27.

DURING a recent visit to Brisbane by the Commission's Executive Officer for Social Development, Dr. Richard Seddon, preparations for the Seminar were carried a stage further, and everything augurs well for a successful meeting.

The formal opening will take place on Monday morning, November 16, in the Senate Room of the University, when participants will be joined by representatives of the Commission's participating governments and by guests from the University, Emmanuel College, and the Brisbane community.

(Continued on page 42)

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Dr. **S. A. RAYNER**, Assistant Registrar, University of Queensland, will be Liaison Officer between the University and the Seminar.

Fisheries Development In Papua And New Guinea

The work being carried out in Papua and New Guinea in freshwater, estuarine, and sea fisheries, and in pond culture, as part of a development programme approved in 1955, is reviewed in the article below.

By A. M. RAPSON*

The Administration's fisheries research vessel "Tagula", which has carried out extensive investigations in Papuan waters. Designed in Scotland and built in Brisbane, she is 60′ long with a beam of 18′ and draft of 7′. She has accommodation for a European master-engineer, three technical staff and a crew of ten Papuans. Her cruising speed is 8½ knots, and cruising range, 1,200 miles.

THE Division of Fisheries in Port Moresby is carrying out, with a small staff of technical officers, a programme of fisheries development approved in 1955. It includes work on freshwater fisheries, pond culture, estuarine and sea fisheries.

Freshwater Fisheries

Four weed-eating species of fish have been introduced to the territory. Only *Tilapia mossambica* (Peters) has bred successfully, and is now distributed in some lowland areas and in parts of the Highlands. Tilapia are established in the Waigani Swamps, about 20 miles from Port Moresby, and some thousands of pounds are taken annually from this low-lying area, which is inundated at each wet season when the Laloki River floods. In the dry, when the water recedes, the swamp is reduced to isolated waterholes in which some river fish remain.

An important development in the introduction of this weed-eating fish is that quantities of better types of fish, bream (*Sparus*) and barramundi (*Lates*), also enter the swamps. Although it may not yet be economical to fish this water system as a commercial enterprise from Port Moresby, it is a highly-productive area, and is profitably fished by natives living near the swamps.

* Dr. Rapson is Chief of the Division of Fisheries, Department of Agriculture, Stock and Fisheries, Papua and New Guinea.

At altitudes of 1,500 to 3,000 feet, only moderate production of fish from tilapia ponds has been achieved. This is due in part to lack of suitable pond weeds, so that the fish feed mainly on small algae.

In the extensive Highlands plateau, altitude 5,500 feet, there is a similar lack of suitable weed. However, tilapia thrive in some localities, but yield is usually low.

The reason for the differences in production is related to fertilizing and to water temperature, which varies appreciably. Surface temperatures of ponds at this altitude on fine days exceed 80° F. Temperatures at the bottom of the ponds, where the fish spend a greater part of their time, often drops to 60° F., and does not change appreciably from day to day. This is caused in part by the long periods of windless days.

Greatest success in the Highlands has come from the feeding and fertilizing experiments associated with stock. A single, well-fertilized pond of one acre at Binden Plantation, Mt. Hagen, after being stocked for 18 months, produced, on draining, four tons of fish. Similar methods of cultivation and harvesting could, in good localities, produce comparable results. At an altitude of 6,500 feet, at Kutu Plantation, tilapia do not breed.

Although culture of tilapia has been considered undesirable by some writers (see Marshall Laird, *Studies of Mosquitoes and Freshwater Ecology in the Pacific*, Royal Society of New Zealand Bulletin No. 6, 1956), results obtained in Papua and New Guinea show that in well-managed ponds, tilapia effectively control mosquitoes. In natural waters, tilapia reduce the mosquito population considerably.

Ponds placed in strategic positions appear in some instances to attract breeding mosquitoes, with the result that the larvae are effectively controlled by tilapia. Where ponds have been constructed and left unstocked they have not altered the general pattern of mosquito population. At Dobel, Mt. Hagen, unstocked ponds after many months had no mosquito larvae, while at Kerowagi, an area with malarial mosquitoes, ponds left unstocked and under-stocked became breeding places for mosquitoes.

As a mosquito control, tilapia is more effective than *Gambusia*, and in addition it is edible. In some Highland areas many children have eaten tilapia. They have not eaten any other fish, and probably little meat.

Tilapia have recently been introduced to the Mortlock Islands in an attempt to produce more food and also to control mosquitoes in the gardens where swamp taro (*Cyrtosperma* sp.) is cultivated, and where mosquitoes sometimes develop on

Above: Catching fish with a lift-net in a backwater of the Jimmi River. Apogon and catfish are main species caught. Right: Small fish-trap at Rabaul. The coiled vines are used as mooring lines for larger traps.

such a scale as to limit work in gardens.

Osphronemus gouramy and snakeskin *Trichogaster pectoralis* introduced from Malaya in 1958 have not yet produced fry. They will be best for low—and medium—altitude ponds. Singapore carp fingerlings received from the Taronga Park aquarium, the last vegetable feeder introduced, will be better adapted for Highland waters.

Several rivers have been stocked with brown trout by private individuals, planters' associations and one large company. A few fish which have been caught show that trout will grow, and some reach a good size. The largest authenticated record is of a trout weighing 7 pounds 4 ounces. Some trout less than 8 ounces in weight have been captured with characteristics of old fish, with the hooked lower jaw. River temperatures at an altitude of 5,500 feet are about 64° to 68° F., rather above optimum requirements of trout.

In the Highland rivers, fish food—insects such as mayfly larvae, cadis larvae and other aquatic animals—are similar to those found in temperate zones. Quantities, however, are small, and the insects usually are much smaller than necessary to produce good stocks of large fish. The absence of wooded areas which contribute a large variety of food for many species of fishes is also a limiting factor in fish production. Eels are found in many Highland streams, and small numbers of these predators can seriously reduce stocks of more desirable species.

Estuarine Fisheries

In estuaries and lower reaches of the larger rivers several fish are important, for example: mullet (*Mugil*), bream (*Latus*), jewfish (*Scieana*), threadfin salmon (*Polynemus*) and milk fish (*Chanos*).

In Papua, barramundi (*Lates*), an important north Australian fish, is in considerable abundance, but up to the present time this species has not been recorded from New Guinea where, however, a species of cod (*Epinephelus*) is a valuable food fish.

Often fishing is limited to fish runs related to the wet and dry seasons, fish moving down stream in the flood seasons. When the rivers are in high flood, more fishing takes place outside the mouths of estuaries where some species spawn and the concentrated shoals of fish are more easily harvested. When the rivers are low and the waters clear, mullet, barramundi and other species travel up the rivers and these runs, which occur regularly at special phases of the moon, are important fisheries. New types of fishing gear being introduced offer promise of better harvest from these important migrations.

Recently-Introduced Fishing Gear

Distribution of machine-made nets and twines for making fishing nets offer very great development possibilities. With a growing cash economy, hand-made nets of local materials are costly.

The work of obtaining fibre materials and making nets from the hand-made twine is slow and laborious. In Manus Island the cost of a hand-made net 18 ft. long and 8 ft. deep, used to catch malambul (*Selar crumenophthalmus*) exceeds £10. The value of netting in synthetic material of similar thickness, but with better wearing qualities and strength, would cost less than £3.

Hauling nets of 3-in. mesh, by 100 meshes deep, 250 to 300 yards long, of

A family party of Papuans setting fish-traps in one of the many lagoons of the Balumo region in western Papua. Food is abundant in this area, as the swamps attract vast numbers of waterfowl and the lagoons teem with fish.

Papuans at a Milne Bay village making fishing nets from twine hand-woven from fibre obtained from jungle plants and trees. It is a slow and costly process, and efforts are being made to promote wider use of machine-made nets and twines.

12-thread cotton, have produced up to 800 pounds of fish per haul. Similar nets, 1-1¼-in. mesh, by 100 meshes deep, 200 to 250 yards long, of 9-thread cotton, have produced up to 500 pounds per haul. Methods of handling this type of small fish catch (bait fish) are being investigated.

Nylon nets have been used in estuaries for catfish, freshwater snapper (*Lutjanus argenteus*), and large bream, while barramundi have been taken up to 40 pounds in weight. Experiments with this type of net are continuing, to determine the minimum strength of twine which may be economically used to catch the largest size of fish. Preliminary experiments show, for example, that although barramundi of 20 to 40 pounds can cut a 2-in. or a 4-in. mesh of 90-pound breaking strain fibre, a 45-pound breaking strain net material in 7-in. mesh will hold 20-pound fish.

In clear water, small fish up to 500 pounds per haul have been successfully caught with a lift net. Shoals of sprats which come inshore in the south-east season have been caught with a net 40 feet by 80 feet, set on the bottom and lifted quickly when the fish move over it. Small bream over reefs have also been caught with this type of net.

Fisheries Research Vessel

A 60-foot vessel, the F.R.V. TAGULA, equipped for carrying out a wide range of fishing activities, operates in Papua. It is well equipped for trolling with motor boats, using the Queensland fishermen's methods—oceanic longline fishing and small mesh trawling—and is equipped to carry out a small amount of scientific research.

A 30-foot vessel is used for inshore work near Port Moresby, and experiments are continuing using outboard motors in sheltered waters. Several different types of small craft, in addition to double canoes, are being tested.

Although trolling for tuna and mackerel has been successfully carried out for centuries, the introduction of good lines with wire traces has greatly improved catches. The use of garfish (*Hemirhampus dussumierii*) for bait, as used by Queensland fishermen, has also given excellent results in fishing the mackerel runs.

In work carried out by the TAGULA, most satisfactory results have been obtained east of Samarai, where many catches exceeding 500 pounds per day have been obtained, while enough exceeded 1,000 pounds a day to warrant this method being adopted in commercial fishing. Considerable information on the Spanish mackerel migrations has been collected, and many important grounds for this species are now known. Greatest aid has been the use of echo-sounding equipment to locate reefs on dull and rainy days.

In hand-lining, a large proportion of the catch is of poor quality snapper (*Lutjanus waigiensis*), called red bass. Best results are obtained at night, usually on reefs some distance from sheltered anchorages, and navigational difficulties limit reef fishing to irregular intervals. Small motor boats and canoes, however, often bring in quantities of government bream (*L. sebae*) and Malabar snapper (*L. malabaricus*) from 35-fathom reefs.

Deep vertical lines fishing at depths of 75 fathoms in Rabaul Harbour are yielding considerable numbers of a large red fish (aprion?) up to 15 pounds in weight. This is not a first-quality fish, but it is meeting a considerable demand for fresh fish in the area (it is, however, not satisfactory in the "raw fish" dishes favoured by Chinese). Experiments are continuing using horizontal lines on the bottom.

A fourth method of fishing using horizontal longlines in the open sea is being tested. Garfish, fish strips, squid, mullet and silver biddies (*Gerres argyreus*) for bait have not yet given conclusive results. A variety of fish, including yellowfin tuna, ocean mackerel, sail fish, sharks and dolfins have been caught. However, using only five miles of longline has not proved economic because of the distances to be steamed to the fishing grounds—the 1,000 fathom line—and the wait between shooting and hauling to make an effective catch.

Garfish produced the best results east of Normanby Island and in the area south of Jomard Entrance to south of Suau. No fish were caught using squid (caught on beaches) south of Hood Point, although yellowfin tuna offshore feed largely on an oceanic squid. Yellowfin less than 20 pounds are often taken on troll lines close inshore. The yellowfin taken by longlining ranged from 60 to 140 pounds.

Preservation Of Fish

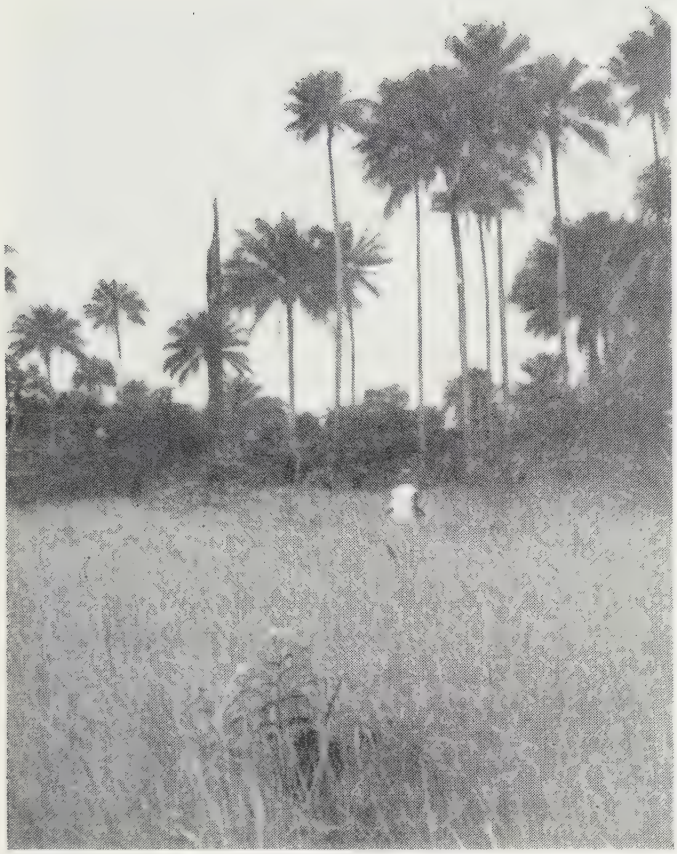
A small refrigerator installed at Loupom Island on the south coast of Papua by the Division of Fisheries for bait storage has been used by a fishing group under technical direction from the Division, to freeze fish for the Port Moresby market.

Results up to the present time would not warrant installation of a freezer specially for commercial fishing. However, with improved gear and better knowledge in handling fish, prospects for ultimate success in this method are fair.

Total sales of fish caught by the fishing group for 11 months amounted to £1,240, while costs, which included erection of freezer building, freight, engine operator's wages, and cost of fuel were £1,062. Although cash profit was small (£178), the project could be considered successful, as a considerably greater quantity of fish was caught and eaten than in previous years and most people in the islands benefited from this industry. A considerable part of the costs also was returned to the people in wages or in some other form.

The traditional method of preserving fish by smoking is widely practised, and

(Continued on page 62)



Typical Sierra Leone oil palm belt. The dead palm was found to contain Oryctes owarienses larvae.

Coconut palm attacked by Oryctes. Lungi, Sierra Leone.

SPC Entomologist Searches In Africa For Beetle Controls

Last April the author arrived in West Africa to conduct a search for predators and parasites that might be useful in the control of the rhinoceros beetle (ORYCTES RHINOCEROS) *in the South Pacific.*

By C. P. HOYT*

THE writer arrived in Sierra Leone, West Africa, on April 21 last to conduct a search for predators and parasites of rhinoceros beetles which might be useful in the biological control of the coconut rhinoceros beetle (*Oryctes rhinoceros*) in the South Pacific region.

This date was chosen as it was the approximate end of the dry season. Actually, the rains started about the middle of May, which proved fortunate, as it gave an opportunity to observe the fauna of the breeding sites of *Oryctes* in both the wet and the dry periods.

Sierra Leone is divided into two main political areas—the Colony, which is composed of a small islet and a town in the Bonthe area, and a large peninsula some 30 miles in length with a chain of fairly high mountains extending its length. At the northern end of this peninsula is situated the city of Freetown, the main port and capital of Sierra Leone. The remainder of the country has protectorate status and is divided into tribal districts, each with its paramount chief.

50-Mile Belt Of Wild Oil Palms

Bordered on one side by the sea, and intersected at intervals by large rivers, there is a broad belt of wild oil palms extending from the Guinea border on the north to the border of Liberia in the south. This belt of palms extends some 50 miles inland, and it is here that the rhinoceros beetles are most common.

Around the villages, both coastal and inland, coconut palms have been planted, but they are not found in the numbers common to many of the South Pacific islands, and frequently show signs of various soil deficiencies. However, they seldom show any sign of attack by the rhinoceros beetle.

Three Species Of Rhinoceros Beetle

There are three species of rhinoceros beetles in Sierra Leone: *Oryctes owariensis, Oryctes monoceros* and *Oryctes boas.* The first two breed in rotten wood, the last seems to prefer compost heaps. The first two species are most often found in the standing dead oil-palm trunks or, where they exist, in standing dead coconut palm trunks.

In the case of the oil palm, the dead

* Technical Officer, Pests and Diseases, South Pacific Commission.

Lightning Strike On Coconut Palms

WHEN lightning strikes a coconut plantation the results, manifested by patches of dead and dying palms, often give the impression of a spreading infectious disease.

The central palms of such a patch—those struck directly—die within a few days, while the damaged palms in the surrounding area decline gradually during the following months. The leaves drop from the stem, which itself is frequently found to be "bleeding".

Generally from one to three palms are struck directly, and perhaps a dozen in the surrounding area partially. On the dying palms it is not uncommon to find the "stem-bleeding disease" which is due to fungus, *Ceratcstomella paradoxa* (conid. form *Thielaviopsis paradoxa*).

The effects of lightning strike have been studied in the South Pacific area by M. Dadant in the New Hebrides,[1] and more recently by the specialists of the Department of Agriculture in Papua and New Guinea.

J. BARRAU.

[1] An article on the subject by M. Dadant appears in AGRONOMIE TROPICALE, Vol. IX, No. 1.

trunks are usually a product of the extensive palm wine industry. It is the custom of the country to cut a slit in the trunk just at the base of the crown. Into this slit a hollow tube is then inserted and through this tube drips the sap of the palm into a gourd. The juice ferments almost at once and forms the palm wine much favoured by the people of Sierra Leone.

Unfortunately large weevils, bacteria and fungi invade these slits after the juice has stopped flowing, and if the tree is not able to repair this damage, it dies. In a year the dead crown falls off and shortly thereafter the remaining tip decays sufficiently to attract a variety of insects that breed in rotten wood. All of these work down into the softer, inner part of the trunk, and after several years there is formed a hollow partly filled with frass and extending ten to twenty feet down inside the trunk. In this hollow, *Oryctes owariensis* and *O. monoceros* lay their eggs, and the resulting larvae feed, extending the cavity still further down towards the base of the palm.

The interiors of these rotten palm trunks form both places of refuge as well as breeding sites for a large and varied fauna. The hollow (and at times the open top) contains snakes, lizards—often large in size—and birds and rats, both of which nest in the cavity, as well as cockroaches, crickets and large assassin bugs which prey on the last-mentioned inhabitants.

Black, spidery - legged tenebrionid beetles are common in the upper layers of frass, while further down are larvae and adults of bright green cetoniid beetles, oddly-shaped small dynastid beetles and *Oryctes* (the rhinoceros beetles). The small carabid beetles that burrow throughout the cavity, feeding on the various small grubs and large elaterid larvae (1 or 2 per trunk), likewise attack the soft immature stages of the dynastid and cetoniid beetles.

Dead oil palm trunks at Lungi, Sierra Leone. Internal damage to the trunk by invading insects, bacteria and fungi following tapping near the crown in the process of making palm wine is the usual cause of death.

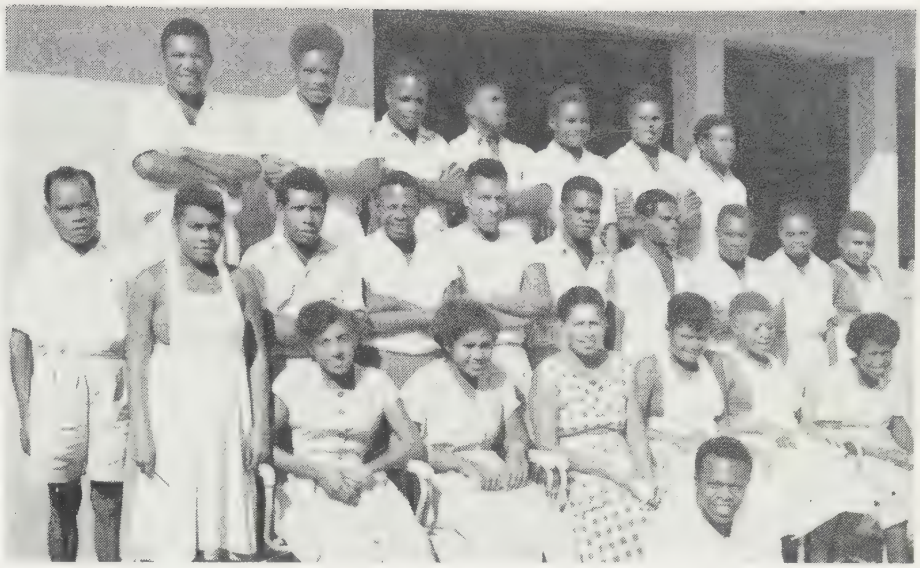
With the coming of the rains, the fauna of the rotten trunks becomes more confused. The eggs of the dynastid beetles, which are habitually packed into balls or tubes of compressed frass, become ideal breeding sites for mites which use the egg as a vast food store on which to raise their families. Just how the mites get to the packed-in egg, and how these tiny beasts become transported from one trunk to another, is not known at present. Occasionally large, fierce scaritid beetles invade the cavities to crush and feed on the helpless beetle grubs. In addition, fly larvae of many kinds appear in the rain-dampened trunks, some feeding on the ever-present moulds or fungi, others preying on some small insect life or possibly on the mites which in their turn feed on the large beetle eggs.

Linking Predators With Victims Difficult

The search for predators of rhinoceros beetles tends to resemble more closely the work of a detective, for it is necessary to decide which predator killed which victim.

This decision must, from the nature of the subject, be based largely on circumstantial evidence gathered in the field, for in many instances attempts to duplicate field conditions in the laboratory fail, and in countries such as Sierra Leone, suitable and extensive laboratory facilities may be lacking entirely.

It is therefore necessary to conduct a large number of investigations, and at times the remaining pieces of insects left inside these hollows provide better clues of what has happened than the living ones themselves.



The medical dressers and nurses from New Hebridean villages who attended the training course in Port Vila, photographed outside the pavilion used as a classroom.

Health Education In The New Hebrides

A four-week refresher course for twenty-five medical dressers and nurses from villages in the New Hebrides was held at Port Vila from June 8 to July 7. It was organized by the British Medical Officer in the territory. He was assisted by the Commission's health education specialist, who contributed the article below.

LEONIE J. MARTIN

HEALTH education is an essential part of the work of all members of a health team, whether they are specially trained for this or not. Training can help by giving the health worker better understanding and better tools with which to work.

This was very well illustrated recently in the New Hebrides, when 25 dressers and nurses met together in Vila for a four-week Refresher Course. This included revision of some of the clinical problems faced daily in village dispensaries, but it was also designed to provide some specific training in the preventive work that so many of them have been attempting to do for years past. It may well have been the urgent need that so many of them felt that made them so anxious to have whatever help could be given with the difficulties of village teaching in preventive medicine and hygiene.

The course was developed by the British National Service of the New Hebrides, at the suggestion of the Health Education Consultant seconded to the South Pacific Commission to follow up the work of the trainees of the Health Education Training Course held in Nouméa in 1957.[1]

It was planned and developed by the British Medical Officer, with technical help from the Commission, which in addition provided its own newly-appointed Health Education Officer as a full-time assistant, together with another officer for part of the time. The British Medical Officer of the New Hebrides gave part-time to the course, and in addition nearly full-time help was given by three nursing sisters, who represented three of the missions in the area from among whose trainees the participants were drawn.

It is not proposed here to discuss the factual teaching undertaken, beyond

Medical Dresser Massieu here demonstrates to his fellow-students how he will use the flannelgraph he has made to teach his people how to plan a clean, healthy village (upper section of picture) and how much better this is than a dirty village (lower right).

[1] See *SPC Quarterly Bulletin*, October 1957.

saying that preventive medicine or health education principles were not taught directly, but were based on the formal subject matter.

In many ways the training was experimental in nature. So far as is known, nothing exactly similar had been tried in the Pacific area before. Staff were few, facilities and money limited. There were bound to be some mistakes, especially since some of the teaching methods used were new to some of the staff. Yet in spite of this, progress was made.

For most of the "village hygiene" sessions, there was a general introduction to the particular aspect of the work, developed in as informal a way as possible, with all the participants and staff. Then there would be a division into three groups, each of eight plus one or more of the staff, for general discussion. At times each group might "report back" to the class as a whole, using various means of doing this; at other times no reporting back was done. Occasionally the groups brought up problems that could be dealt with in a "class" session.

Towards the end, an effort was made to use some of the trainees themselves as group leaders, omitting the European members. Unfortunately there was not enough time to develop this as much as might have been possible. It takes a long time for a group of comparative strangers to lose enough of their inhibitions to talk with complete freedom to each other, so that they can begin to find out what makes a group, and how their own and others' actions and words can affect the group.

Another retarding factor, of course, was that not all the trainees spoke English, and even the simple English used throughout was, at least at first, a little difficult for them.

Audio-Visual Aids Extensively Used

Extensive use was made of audio-visual aids, since it was felt that these might help the process of assimilation. Partly because of cost, partly because little prepared material was suitable, partly because it was thought they might have greater interest and appeal, many of the visual aids were home-made by the staff. This in turn gave encouragement to the trainees.

Because of the circumstances existing in villages to which the participants were returning, efforts were made to give them something practical to take back as well as the knowledge they had acquired. Each trainee made his or her own poster, according to what each felt were the needs of his or her particular area, and with sufficient "local colour" to make it interesting and meaningful to the community where it would be displayed. The content of each poster was therefore individual; it was suited to the local needs of the dresser or nurse who designed it; and its making gave sufficient practice to enable each participant to make other posters later on at home, as need or occasion might arise.

Another visual aid used very extensively was the flannelgraph. This is a device consisting of a rough-surfaced backing such as felt, blanket or similar material, on which are placed cutouts with a rough back which will adhere to the backing. A picture can be built up by this means which is flexible, and can be changed to show growth or development, added to or reduced, with ease and rapidity. Often the pictures are made on paper or card, with sand, sandpaper or felt attached to the back.

In view of the difficulties of using paper in the tropics, and to the fact that these materials may need to be carried from village to village, often over rough tracks, with the medical supplies and personal gear of the dresser, it was decided to use a new technique.

White flannelette was used as the material for the pictures, drawings being made directly on to this, outlined with Indian ink for firmness, and coloured in with greasy crayons. Both of these are waterproof, hence will not smudge, and do not affect the fluffy back of the material. The pictures so made are light in weight, small in bulk, are easily rolled up, and if they become too crumpled can be ironed. Ordinary blankets make a good backing.

Each trainee made his or her own flannelgraph to take back home, and this was felt by all to be something that would interest the villages. Each set of pictures, like the posters, was individual and drawn with an eye to local conditions and local colour. The realization that the same pictures could be used in the teaching of more than one lesson in hygiene helped to bring home the realization of the basic principles underlying the specific situations. Even though basic principles were not taught as such, their repetition over and over with the discussion of each specific disease enabled the essential factors to be seen.

In spite of the difficult physical conditions under which all the group lived and worked, one of the most enjoyable experiences was the gradual welding together of everyone and the growing freedom of discussion. The discovery that others, too, had similar problems, and found it difficult to carry on with the work at times, helped to lighten many a burden. The solutions that others offered from their own experiences, though not necessarily directly applicable to other situations, often gave a clue or two as to how some specific problem might be tackled.

I am sure that it was with a growing sense of comradeship, with a renewed feeling of the value of the work being attempted, and an appreciation of the resources that could be tapped, that the course ended. The final evaluation made by the trainees gave real evidence of this; they were completely frank about the difficulties they had experienced, but one and all expressed their appreciation of what had been attempted.

There was a unanimous desire to have a further course every year. Almost everyone felt they had learnt a great deal: the three who did not said this was because the course was too short.

All the group were keenly interested in the flannelgraphs and felt this was an excellent means of teaching in the villages, and one that would bring more co-operation from the people than many other methods. Most have expressed the intention to continue to develop more visual aids for themselves as they go on.

All in all, the course showed without any shadow of doubt that in spite of a limited budget and far-from-ideal conditions, much can be achieved if there is good will and readiness to learn. It is to be hoped that the New Hebrides will continue the development so happily begun, and will move from strength to strength in this pioneering of health education at the village level.

Nor was the course all work. Bad weather prevented more social occasions, but in spite of the rain we wound up with a memorable feast, complete with pig.

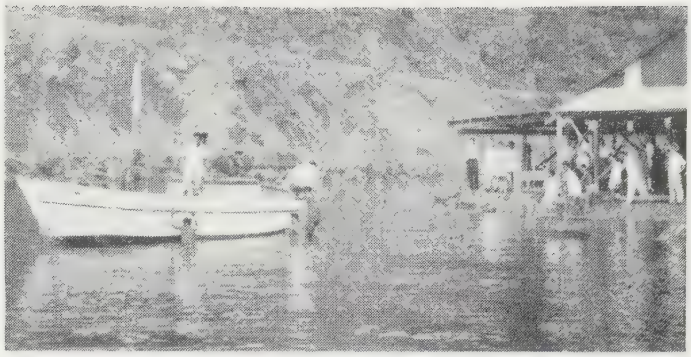
Annual Review Of Commission's Work

Final plans for two SPC gatherings to be held in November—an education seminar and a study group on filariasis—will be reviewed by the South Pacific Commission at its twentieth session, which will open at its headquarters in Noumea on October 13. It is expected to last about twelve days.

Representatives will attend from the six member nations, Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America. Chairman for the session will be the Senior Commissioner for the United States, Dean Knowles A. Ryerson.

The education seminar for the Pacific will be held at the University of Queensland, Brisbane, from November 16-27. Senior education officers from fourteen Pacific territories will attend, as well as education specialists from all six member nations of the Commission. They will study education problems of common concern throughout the region.

The study group on filariasis will be held at Commission headquarters from November 12-24. Specialists in mosquito-borne diseases from Pacific territories and metropolitan countries of the Commission will attend. They will review progress made in the campaign against filariasis in the Pacific since the SPC Filariasis Conference was held in Tahiti in 1951.



A dramatic moment—the launching of the first motor fishing boat of a number being built at the fisheries station at Hollandia.

Fisheries In Netherlands New Guinea Make Steady Progress

In Netherlands New Guinea, one inland and two sea fisheries stations have been established, and the first of a number of motor fishing boats has been built and launched.

By H. VAN PEL*

THE planned development of fisheries is one important way in which the authorities in Netherlands New Guinea are endeavouring to improve the protein content of the local diet.

Under the direction of experienced fisheries instructors, two fisheries stations have been established, one in Hollandia and the other in Manokwari.

The first of a number of motor fishing boats was recently built at the Hollandia station. The accompanying photographs taken during the launching show the type of craft being built. While the boats in this series will be comparatively small, it must be remembered that the step from canoe to motor boat is a considerable one for the local people to take.

Inland Fisheries Station Established

A start has been made in the field of inland fisheries. A central inland fisheries station is being built in Jabaso, near Lake Sentani, a comparatively short distance from the capital. By July last fifteen ponds had been completed. An office has been built, and a house for the caretaker.

To date, five different species of fish have been introduced in Netherlands New Guinea. They are—

Carp—*Cyprinus carpio.*

Giant gourami—*Osphromenus goramy.*

Tilapia—*Tilapia mossambica.*

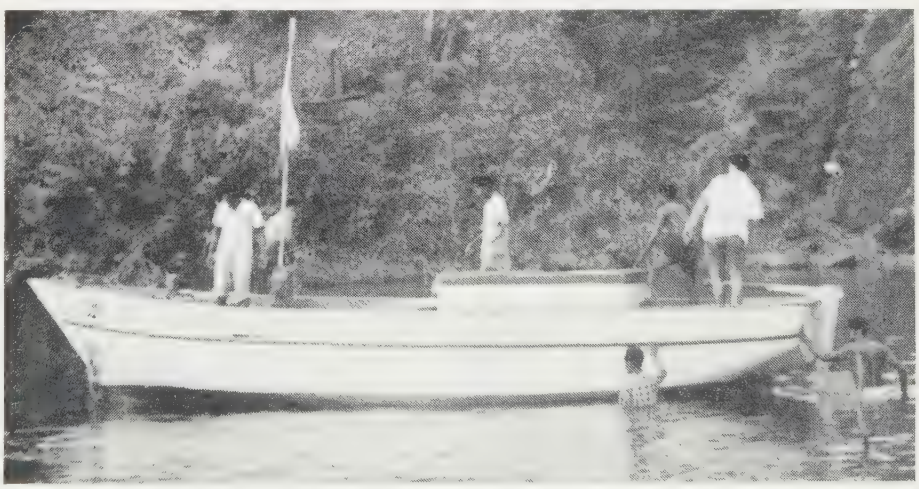
Sepat Siam—*Trichogaster pectoralis.*

Kissing gourami—*Helostoma temmincki.*

The last two species were released in a lake some time ago, and observations have shown that they are now well established. Carp and tilapia have spawned, and distribution of fingerlings has begun.

The active co-operation of the territorial health service in the development of inland fisheries should contribute to the success of this programme.

* Fisheries Officer, South Pacific Commission.



Floating high after her launching, "Kemboong" will be down to her marks after engine, mast, and gear have been installed. (Kemboong is a species of mackerel caught in the tropics.)

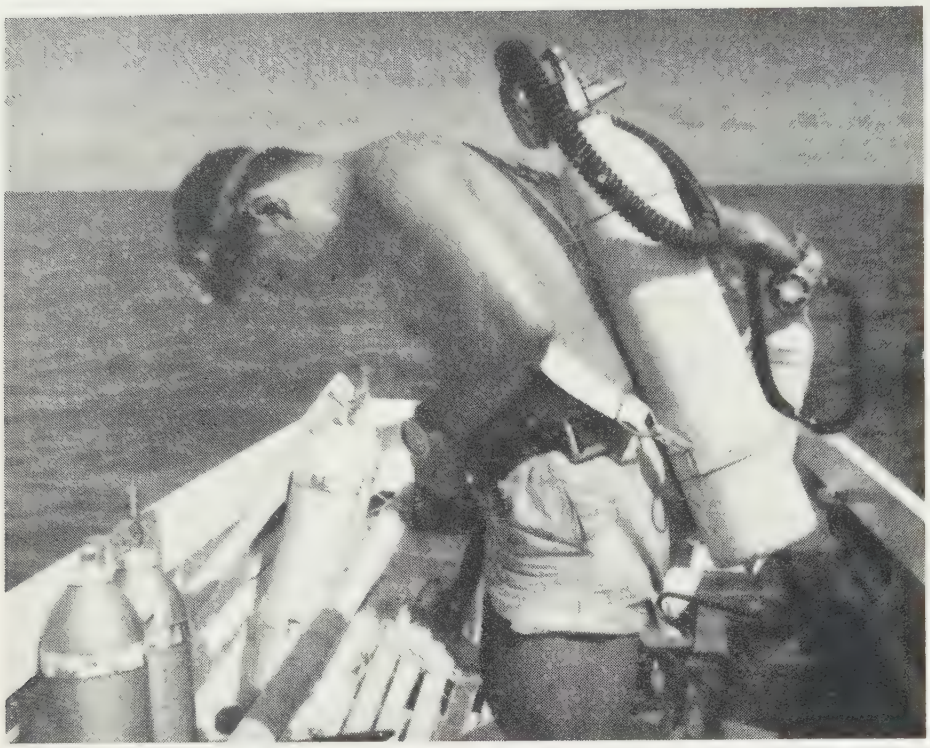
Assistant For SPC Plant Introduction Officer

In its two years of existence the Commission's plant introduction service has shown remarkable growth. Today, practically every aircraft reaching or leaving New Caledonia carries planting material in one form or another—seeds, cuttings, seedlings, tubers, etc.—in transit either to Commission headquarters or from the latter to territories throughout the Pacific (with, of course, rigid observance at all times of quarantine regulations).

An assistant was recently appointed to help the officer in charge of this service, Dr. Jacques Barrau, handle the greatly increased work now involved in maintaining it. He is Mr. J. H. A. Coenen, 25, a graduate of the Deventer College of Tropical and sub-Tropical Agriculture in the Netherlands.

Mr. Coenen's last post was that of a technical adviser in the Middle East and Israel, specializing in citrus growing. He has also had experience in the South Pacific region, having been stationed for one year in Netherlands New Guinea.

Diving For Pearl Shell In French Polynesia



The taking of pearl shell in French Polynesia is strictly controlled. No bed may be fished more than once in every four years, while the minimum size of shells that may be taken in every lagoon is laid down. Lastly, protected beds are maintained to ensure adequate supplies of spat for the lagoons.

By J. DOMARD*

Wearing an aqualung, Pepe Mariteragi, local agent for the Pearlshell Service, prepares to dive.

TWO new decrees concerning pearl shell[1] diving have recently been issued in French Polynesia. One (dated 18 January, 1959) applies to the picking of shells by skin divers; the other (dated 24 July, 1958) deals with the collecting of shells by divers wearing breathing apparatus.

Each year, approximately ten lagoons or parts of lagoons are opened to skin divers for a three-month period, on a rotation basis which ensures that none will be fished twice in under four years. Some of these lagoons are difficult for skin divers to work because they are either very large, remote, or shark-infested. In such cases, divers wearing breathing apparatus may also be authorised to operate.

Apart from the four-year rest period, the following regulations have been issued in order to ensure adequate reproduction of the natural stock of pearl shell:

LIMITATION IN THE SIZE OF SHELLS COLLECTED: It is forbidden to fish pearl shells of a diameter less than 13 cm. (5.2″) at their broadest dimension. There are two exceptions to this otherwise general rule—in Takapoto Lagoon, and on the Tearai bed in the Gambier Group, the minimum regulation size is 10 cm. (4.08″).

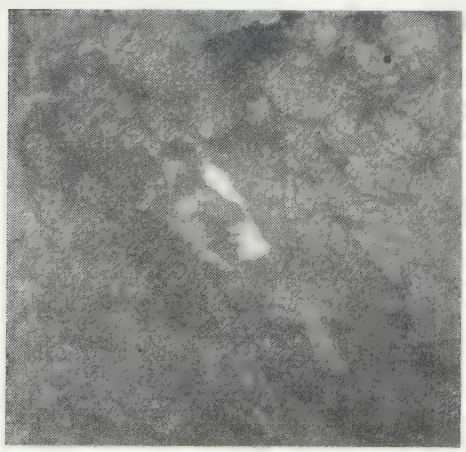
ESTABLISHMENT OF NATURAL RESERVES: The object is to maintain areas closed to fishing, or to develop beds where several thousand oysters are cultivated. Such protected beds will ensure permanent supplies of oyster spat for the lagoons.

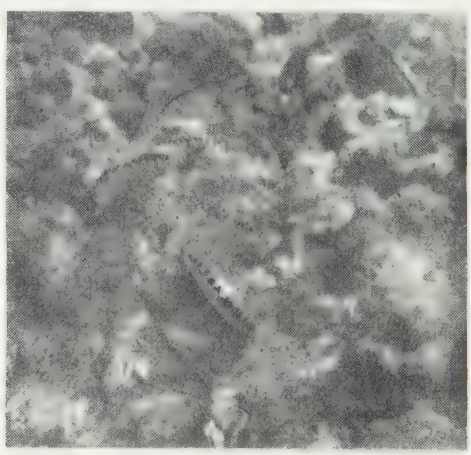
Rich Yield From Hikueru Lagoon

Among the areas recently re-opened to skin divers is Hikueru Lagoon, which is quite rightly regarded as the best

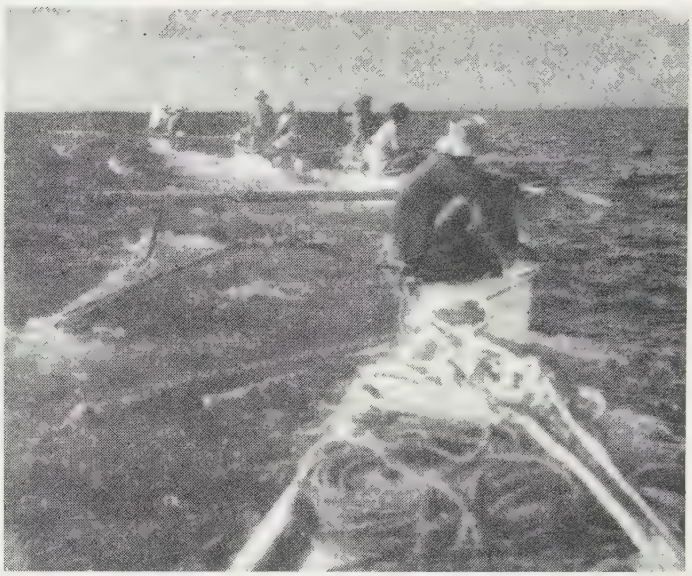
[1] Blacklip oyster (*Pinctada margaritifera*).

*Head of the Fisheries Service in French Polynesia.





Left and right: The author, wearing an aqualung, on an underwater inspection. Centre: Pearl shells embedded in tubular sea anemones (ika-ika).



Above: The only sailing canoe in the fleet of 300 that fished Hikueru Lagoon during the last diving season. All the others were either powered by outboard motors, or were towed. Right: On the way to the pearling grounds.

lagoon in French Polynesia for both quantity and quality of shell taken. At the end of the three-month fishing season within the approved area (the so-called "village area") 405 tons of pearl shell had been collected as against 286 tons four years ago.

The diving season was opened on March 1, and attracted 1,300 people to a village which normally numbers only 200. Approximately 300 roughly-built outrigger canoes crowded the beach. Only one was a sailing canoe; all the others were either powered by an outboard motor, or towed. Each canoe carries one diver only and his mate, the "tete".

The diver sets off at daybreak and reaches the fishing grounds after a journey which may last from ½-1½ hours. An anchor is dropped, sometimes a buoy as well.

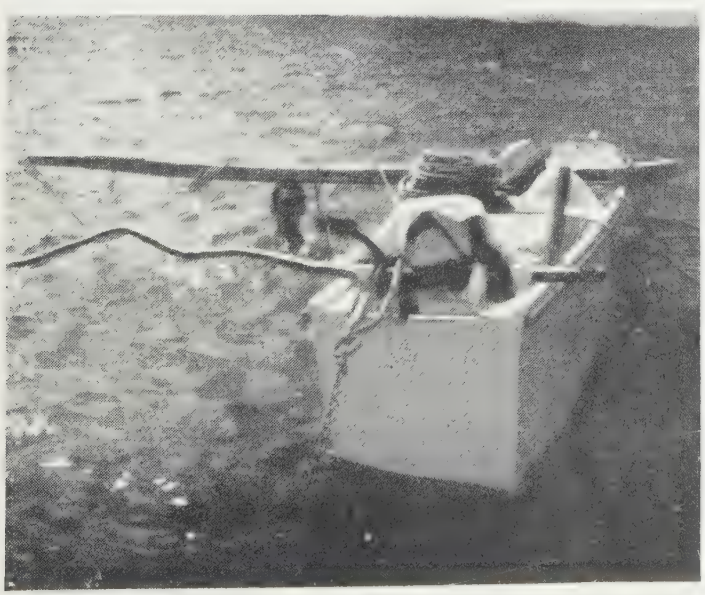
Sitting on the gunwale of the canoe, the diver begins breathing exercises which consist of physical movements and short inhalations followed by deep—but never strained—exhalations.

Meanwhile his mate pays out the rope securing the basket until the latter touches the bottom, then hauls it in again so that the basket is poised at approximately one fathom above the seabed.[2] After that he busies himself with the diving rope, which carries a 15-pound lead weight.

After cleaning his goggles by licking them a few times, or rubbing them with a little brush made from the fibre of a newly-opened coconut, the diver puts on his goggles, takes a few deep breaths, and slides into the water. While going down at a rate of 6-9 feet per second he grips the rope at head level with his right hand, and just above the weight with his right foot. He pinches his nostrils with his left hand and uses his left foot as a rudder. He is thus able to control his

(Continued on page 47)

[2] The basket is usually made from a string-net container attached to the rim of a bicycle wheel.



Above: Martin Tupua, vice-President of the Tuamotu Divers' Association, ready to dive. Note the goggles, the right hand gloved for shell picking, and the coiled diving rope. Right: Home again with a full basket (approximately 145 pounds).

25-Foot Auxiliary Cutter For Pacific Fishermen

This 25-foot auxiliary cutter was designed primarily for use in Pacific waters as a "live-well" fishing boat. However, she could equally well be used as for trochus fishing, carrying copra, or as a general work-boat. She was designed in collaboration with the Commission's fisheries officer by a leading Australian naval architect, who contributed the article below.

By ARTHUR N. SWINFIELD

An artist's impression of the cutter under sail. Under power, a speed of up to 7 knots could be expected from a diesel motor of around 20 h.p.

THIS small 25-foot vessel should fill many needs throughout the Pacific islands. First and foremost she is intended to operate as a "live-well" fishing boat, but if this is not required she could readily be used for trochus fishing or as a copra-carrying vessel.

In an article entitled "25-Foot Motor Fishing Boat For Pacific Waters" that appeared in the *Quarterly Bulletin* for April, 1958, the Commission's fisheries officer, Mr. H. van Pel, referred to the need for small, seaworthy fishing vessels in the South Pacific. He stressed six factors of real importance:

1. SEAWORTHINESS

The small vessel shown in the drawings should fulfil this requirement in the hands of an experienced crew. However, it must be remembered that all standing and running gear (i.e., halyards, shrouds, blocks, etc.) should be kept in good order. The cutter does not carry very much sail, so that the possibility of a capsize could occur only in the event of bad seamanship or jammed sheets.

2. ADAPTABILITY

With the addition of the "live-well", this small vessel becomes much more useful as a professional fishing craft. The difficulty of conveying fish from catch to market in a saleable condition throughout the tropics is a real one, but with the intelligent use of the fish well, this problem should be easier. Long-lining, netting, or trochus fishing could readily be carried out from such a vessel provided with dinghies.

3. AUXILIARY MOTIVE POWER

The sails are intended to operate as auxiliary power to a small diesel motor, which should provide a speed of from 5 to 7 knots according to the h.p. of the engine installed. In this regard an air-cooled diesel engine of from 10 to 20 h.p. would prove quite adequate. When considering the propeller required for the engine, it would be wise to remember that when kept vertically behind the deadwood, a two-bladed propeller offers much less resistance to the water than does a three-bladed one.

4. FOOD AND PERSONAL EFFECTS SHOULD BE KEPT DRY

The small coach-house enables this requirement to be met. Space forward of the fish well should also prove useful.

5. PRESERVATION OF THE CATCH

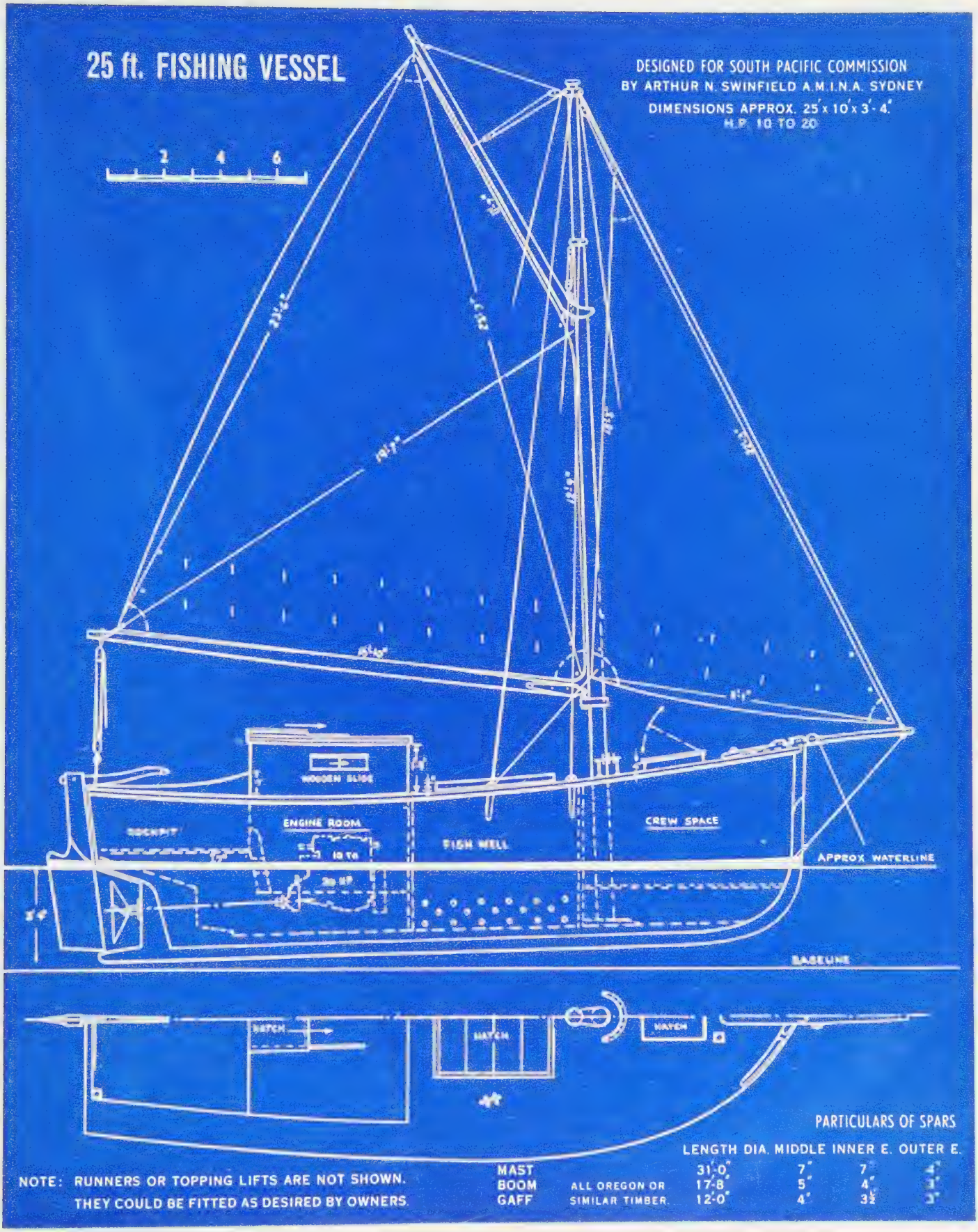
The fish well takes care of this. Incidentally, it should be borne in mind that the inside of the well should be free of any sharp edges or corners that could damage the fish. Actually, the inside of the well should be lined to keep it smooth and easy to clean.

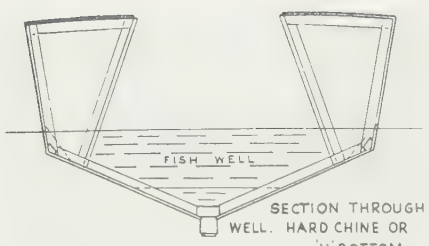
6. REPAIRS AND MAINTENANCE

These can be cut to a minimum by making sure that every precaution is taken during the construction of the vessel to prevent dry rot and damage by borer (wood borer, not sea borer.)

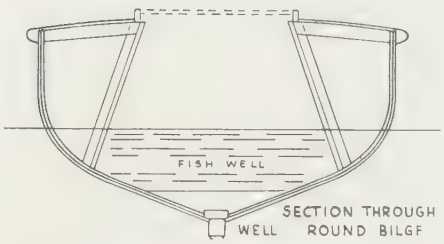
The builder should paint *behind* every surface before fitting two or more pieces of timber together. This particularly applies to the ends of planking onto the stem and stern, and behind the bent frames, between the frame and planking. It also applies where the deck beams fit into or on top of the shelf, under the deck planking itself, and on top of the deck beams. The top of the mast (under the truck) and behind every mast band should be well painted. If any metal protective sheathing is fitted in the way of the gaff jaws, the mast area under such sheathing should be doubly painted.

Wood borer attacks sappy timber, so


25 ft. FISHING VESSEL
DESIGNED FOR SOUTH PACIFIC COMMISSION
BY ARTHUR N. SWINFIELD A.M.I.N.A. SYDNEY
DIMENSIONS APPROX. 25' x 10' x 3'-4"
H.P. 10 TO 20
2 4 6
WOODEN SLIDE
COCKPIT
ENGINE ROOM
FISH WELL
CREW SPACE
APPROX. WATERLINE
BASELINE
HATCH
HATCH
HATCH
NOTE: RUNNERS OR TOPPING LIFTS ARE NOT SHOWN.
THEY COULD BE FITTED AS DESIRED BY OWNERS.
PARTICULARS OF SPARS
LENGTH DIA. MIDDLE INNER E. OUTER E.
MAST 31'-0" 7" 7" 4"
BOOM 17'-8" 5" 4" 3"
GAFF 12'-0" 4" 3½ 3"
ALL OREGON OR SIMILAR TIMBER.



SECTION THROUGH WELL. HARD CHINE OR 'V' BOTTOM



SECTION THROUGH WELL ROUND BILGE

every care should be taken to avoid sap in any part of the vessel. However, one precaution worth while taking is to use any of the copper napthenate preparations (Cuprinol, Dekol, etc.) as a paint or preservative inside the cutter. This helps to minimise the ravages of borer.

Always remember that it is fresh water (rain) that causes dry rot, *not* salt water, so it should not be possible for rain water or hose water to get into any joint in the vessel.

Crosstrees are not shown in the design of the new cutter because it is felt that they are not needed for such a small sail area. Often they are badly installed and cause more trouble than they are worth.

One final point relates to slipping and cleaning, with subsequent painting below the waterline. Never merely "beach" the cutter for scrubbing and painting by running her on to the nearest suitable beach or mud-flat. It is much better to lay down a few crosspieces of tree trunk or something similar—and then to run the keel on top of these. In this way the keel can be cleaned, inspected for marine borer, and then painted.

Always use good-quality anti-fouling paint, and paint in accordance with the manufacturer's instructions.

Hints On Construction

The lines of this cutter show a very hard bilge, and this will need to be carefully watched when "bending-in" the steam-bent frames. Good bending timber will be needed, with plenty of "wet steam" in the steam box. (Lines are also available for a similar vessel designed with a hard chine and "Vee-bottom".)

The average width of the hull planking should be approximately 4½". The bilge planks could perhaps be reduced to 4" and the sheer plank increased to 5". The garboard (or plank nearest the keel) could be 6" in width.

A few helpful suggestions to the amateur builder may not go amiss:

(i) Build this vessel under cover on blocks 18" high. Use four blocks anchored firmly in the ground and to each other.

(ii) Make sure that all hull planking is as seasoned as possible and keep it under cover at all times. Do not stack it plank against plank—use small strips of timber between every plank so that drying air can circulate throughout the stack.

(iii) Build the vessel with strong moulds—then fit the garboard and sheer planks to them.

(iv) Then use 2½" x 1" battens on the outside of the moulds (about 12" apart) to form a shape inside of which all steam-bent timbers (or frames) can be bent.

(v) Then plank up on these steam-bent timbers, taking away the temporary battens as you go.

(vi) All stringers and clamps must run from the bow to the stern. Do not join them all at the same mould.

(vii) If possible, install your engine in the boat before all planks are fitted. This allows you actually to see inside and outside the boat when boring the shaft hole.

(viii) Do not forget to "fair" the deadwood away after the stern-tube flange is fitted and fastened in its position. This allows the water to flow cleanly to the propeller and give your boat more speed.

(ix) The measurements shown on the lines drawing are taken to the outside of the planking. Be sure to allow for this when making the moulds by deducting the thickness of the planking in every case.

25-FOOT AUXILIARY CUTTER

PLANS AVAILABLE

Complete sets of drawings for the 25-foot auxiliary cutter described in the accompanying article are available from the SOUTH PACIFIC COMMISSION, BOX 5254, G.P.O., SYDNEY, AUSTRALIA, *price £STG.4/4/- per set, post free by surface mail.*

Each set contains five separate plans, as follows:—

Number 1 . . . *gives offsets and lines for a round-bilge vessel.*

Number 2 . . . *Depicts the general arrangement and sail plan.*

Number 3 . . . *gives details of stern, frames, stem and transom.*

Number 4 . . . *shows details of the amidships section and of deck framing and rudder.*

Number 5 . . . *gives offsets and lines for an identical vessel but with "vee" bottomed lines.*

Cocoa Industry In The Solomons

(Continued from page 22)

in progress for some years most of the incompatibles will have been discovered and described.

Finally, the lowest level, or nurse shade, must be created. Pawpaw, tree cassava or any of the standard legumes will provide fast-growing nurse shade for the very young cocoa. Any which are used must be capable of being easily removed after the cocoa reaches its third year of growth.

I was told that some thinning out of the intermediate shade layer is necessary as the development of the cocoa proceeds, because the saplings continue to grow too, and eventually may cast too much shade. This thinning out is accomplished with the use of a hormone tree poison, sprayed on to the bark, and encircling the tree to be killed. Any tree so poisoned gradually withers and dies by drying out. The pieces which eventually break away and fall are usually without sufficient weight to damage the underlying cocoa.

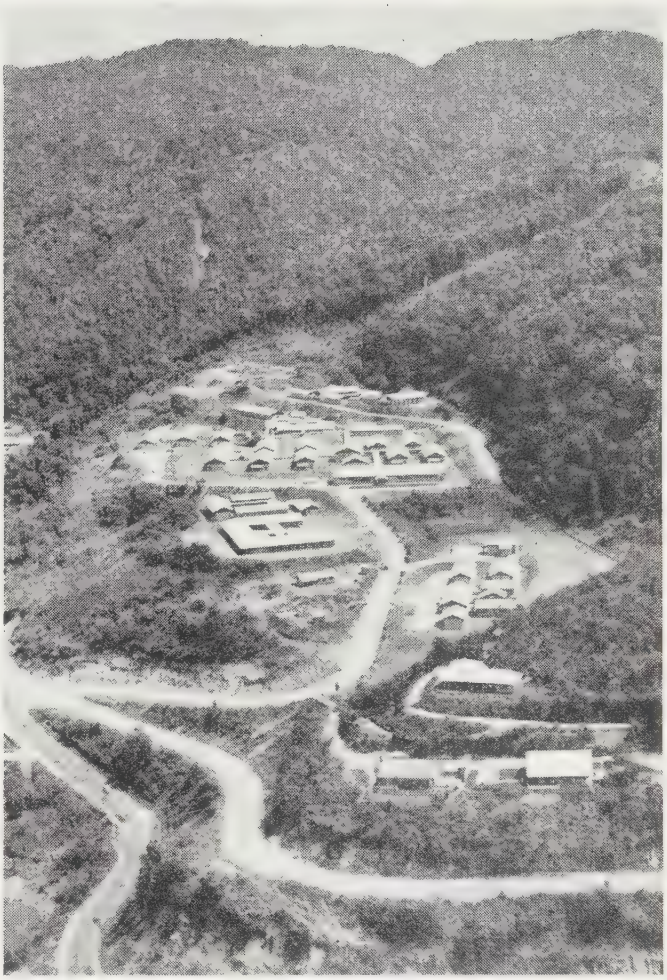
I was particularly impressed with this scientific approach to shade control by means of forest trees. At a distance the area gave the effect of being no more than light virgin forest. When a closer examination of the shade pattern which the bush trees created was made, I found that only careful planning and close attention to the principles I have described could have accomplished such perfect results. The shade pattern on the ground on a clear day at noon was fifty per cent. shade and equal sunlight in the classical checkerboard style, the ideal shade for cocoa.

The soil in the Auki demonstration blocks was not above average elsewhere. It is a medium clay loam, with a fairly light crumb structure; there was a good ground cover of natural leaf mulch. The soil underneath the mulch was cool.

Under these conditions the development of the seedlings was even and the growth sturdy and vigorous. Within the age groups represented I have never seen better or more healthy cocoa anywhere.

If the smallholders will continue to follow the techniques demonstrated, and there is some evidence to show that they are doing so, the future of the Solomon Islands cocoa industry will be assured along practical and economic lines.

The efforts and enthusiasm of the extension officers of the Cocoa Division towards this end are worthy of the highest praise.



Above: The arrival of His Excellency the Governor, Dr. P. Platteel, and Mrs. M. A. Platteel-Laseur for the official opening of the new General Hospital on July 3 last. Right: An aerial view of the new hospital.

New Million-Pound Hospital For Netherlands New Guinea

On July 3 last a new, modern hospital with thirteen wards and 360 beds was opened at Hollandia, Netherlands New Guinea. Cost of building and equipping it exceeded one million pounds.

By G. HOEKSTRA*

JULY 3 last will go down in our medical annals as a great day for Netherlands New Guinea, because on that date the new Central Hospital and the new headquarters of the Division of Malariology were officially opened by His Excellency the Governor, Dr. P. Platteel, and Mrs. M. A. Platteel-Laseur.

Guests from every part of Netherlands New Guinea assembled for the opening, while the presence of Dr. Scragg, Director of Public Health Services in Papua and New Guinea, and Dr. Wright, Deputy Director, was much appreciated.

In 1946 the old Central Hospital was established in the Allied Forces' hospital buildings at Hollandia-Binnen, nine miles inland. From there it had to serve the whole of Netherlands New Guinea—not for a couple of years as originally intended, but for thirteen years, during which time extensive repairs were needed, as well as some new building. By 1953 plans had been drawn up for a complete new hospital, but due to unforeseen circumstances a beginning could not be made on its construction until 1956.

The hospital was built in 2½ years by two contractors, the "Bouwmaatschappij Hollandia" and the "N.V. Industriele en Aannemings-Maatschappij V.A.M."

The total cost of construction amounted to £A957,000. Equipment costs totalled £A116,270. Cost per bed worked out at £A3,776.

Hospital Comprises 34 Buildings

The hospital area covers about three acres, and is situated near the harbour at Dock II, Hollandia. Because of earthquake danger the original idea of a compact, multi-storey building was abandoned, and the complex now comprises 34 one-storey brick buildings, of which two are specially intended for the Malaria Control Department. About 800 yards of roofed concrete paths connect the buildings.

Next to the administrative and outpatients' department are thirteen nursing wards, with accommodation for 360 patients. There is a surgical department with two operating theatres and an X-ray department, both provided with the most modern equipment.

The hospital kitchen and laundry also have latest equipment such as steam-jacket boilers, tilting frying pans, oil cooking-range, fully automatic washing machines, shaker, hot-air tumbler, twin-speed press, etc. Two boilers supply the steam for kitchen and laundry. The washing water is softened by a Tymharsiet installation.

* Acting Director of Health Services, Netherlands New Guinea.

Above: A view of some of the buildings, with Humboldt Bay in the distance. Right: Signposts to the wards, which are named after famous health workers. The 34 buildings comprising the hospital are connected with roofed concrete paths.

Eight of the nursing wards can accommodate 29 patients. Next to them are two wards—one for children, the other for obstetrics, with two delivery rooms—then two first-class wards, and one isolation ward for infectious cases.

The nursing wards are named after famous health workers, including Ross, Pasteur, Laveran, Eykman, Curie, Schweitzer, Waksman, Fleming, Koch, Thierfelder, Semmelweiss, Swellengrebel, de Rook.

Operating theatre, X-ray department, delivery rooms, mortuary, and some first-class rooms are air-conditioned.

The Nurses' Home

The nurses' home has accommodation for the matron and 23 trained nurses. Spacious quarters are also available for the Papuan nurses and the student nurses.

Near the hospital, eighteen houses have been built for the medical officers, technical staff, drivers and other hospital personnel.

The new hospital is expected to fulfil a special function in the public health work of Netherlands New Guinea. It will not only serve the people of Hollandia and its environs, but it will also be a centre for patients from all parts of the territory needing specialist treatment.

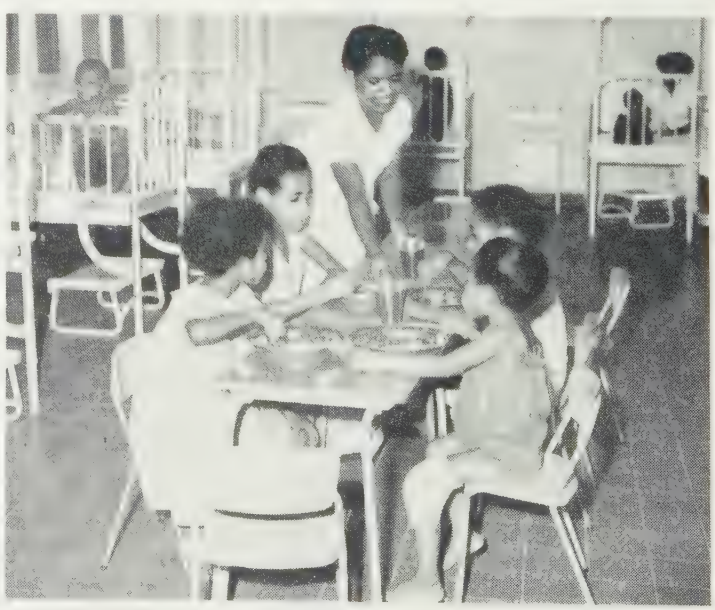
Appointed to the hospital are the following specialists: a physician for internal medicine, a surgeon, an orthopaedic surgeon and a specialist in lung diseases. The appointment of a paediatrician is being considered.

These specialists have all modern facilities at their disposal. Also, the presence in Hollandia of the Central Medical Laboratory and the Chemical Laboratory makes close co-operation possible.

Medical Training Centre For Territory

As well as functioning as a curative and scientific centre, the Central Hospital will also be a training centre for Papuan auxiliary medical personnel from all over Netherlands New Guinea. Basic instruction for the Netherlands New Guinea nursing certificate is given to Papuan girls and boys with at least six years of elementary school training.

After completing a three-year basic



Above: In one of the modern operating theatres. Right: Mealtime in the children's ward.

course in the Central Hospital, the male students take a two-year practical training course, given by the specialized public health divisions and by the district medical officers. This course prepares them for the Netherlands New Guinea certificate of fully-trained nurse.

The male nurses will work mainly at outpost clinics and in the specialized public health divisions. A small group will remain in the hospitals for specialized work in operation theatres, X-ray rooms, etc. Male nurses already working at outposts may take refresher courses at the Central Hospital.

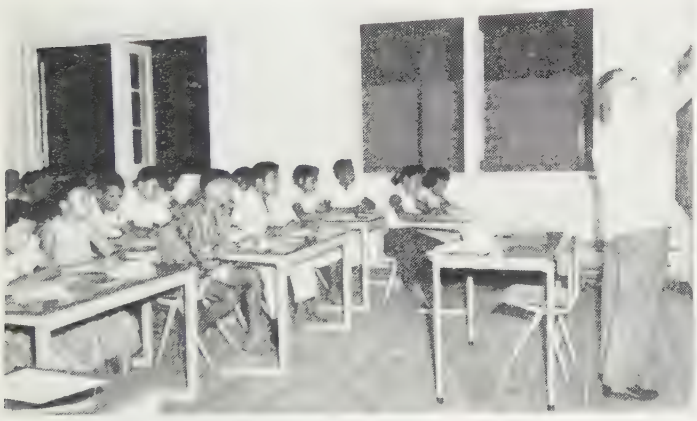
The female students, after completing their three years of basic training, take a two-year course in mother and child care and midwifery. Their future work will include general nursing in the hospitals, followed by midwifery at one of the outpost hospitals or supervision of child welfare nurses in the native villages.

There is also a three-year course for indigenous laboratory assistants, and part of a three-year course for junior pharmacists. It is intended to train X-ray assistants in the near future.

A two-year course for the training of child welfare (village) nurses is given partly in the children's wards and delivery rooms of the hospital.

(Continued on page 47)

Above: View of one of the eight nursing wards that will each accommodate 29 patients. Right: Malaria technicians at work in a laboratory of the Division of Malariology.



Above: Students listen to a lecture by Dr. Jac. S. de Vries, Medical Superintendent of the Central Hospital. Right: Dining hall for the student nurses.

Above: The kitchen is equipped with steam-jacket boilers, oil cooking-ran ge, revolving electric frying pans, and a battery of pressure cookers. Right: The laundry. Its equipment includes a battery of fully-automatic washing machines, hot-air tumbler, and two automatic presses.

Planning radio programmes for Fiji women. Left to right: Mrs. Cokanasiga (Fijian language); Mrs. Cecile Lamont (who is responsible for all FBC women's and children's programmes); Mrs. Marion Raymer (English language); and Mrs. Kalid Hassan (Hindustani language).

Fiji Women Eager For Progress

Co-ordination of the work of women's voluntary organizations, and more provision for adult education, are two urgent needs of women in Fiji today.

By CECILE LAMONT*

THE South Pacific Commission is to be commended on its appointment of a Women's Interests Officer. While this would probably not have eventuated immediately without the generous provision of funds from the United Church Women of America, it is a promising beginning to a long-neglected aspect of sociological progress in the South Pacific territories —the part that women can play, and the influences they exert in the community.

Attention to the special needs of Pacific Islands women has seemed rather over-long in gaining official recognition, but there may be comfort in the fact that, through their initiative and very evident desire to assume responsibilities, they should prove a very good "risk" for any money spent on their behalf. If initiative and self-help are considered pre-requisites for effective sociological service, it is abundantly clear that the women in the South Pacific territories will justify any help that is given them to raise their standards of living.

The appointment of Miss Marjorie Stewart is most timely, when the women are asking for guidance and direction in their work. In Fiji, to take one example, Miss Stewart reiterated the need for co-ordination of the work of women's voluntary organizations.

Their value to the community is quite considerable. There are about forty women's organizations in Suva alone, all in some way or other concerned with welfare work, and if a study of them reveals remarkable examples of "self-help," it also shows the necessity for more provision of adult education for Islands women so patently eager to learn and to progress. Fiji is not alone in this.

"Workshop" To Co-ordinate Women's Activities

As a first step, and as a direct result of Miss Stewart's visit to Fiji in June, when she was en route to Aitutaki to take up her new appointment, the women of Fiji will endeavour to assess the needs of women of all races by holding a Workshop—a four-day residential "school"—to find out what women want to learn, and how to teach it.

This Workshop, organized by the multi-racial Fiji branch of the Pan-Pacific and South-East Asia Women's Association, will be an earnest attempt to get down to fundamentals in co-ordinating women's voluntary work, and to help the women of all races in Fiji to take a more effective part in community development.

Weekly Broadcast Sessions For Women

So far, apart from the patient and steady work of the Medical Department and what little can be done by the Education Department in its already overcrowded schedule, the only "mass" education on general lines for women is conducted by the Fiji Broadcasting Commission who, through regular weekly sessions for women in English, Fijian and Hindustani, endeavour—and with no small success—to carry out their three guiding principles of news, knowledge and entertainment.

The enthusiastic reception of these programmes, particularly by the Fijian and Indian women, may be gauged from the fact that although Fijian women are mostly literate in their own language, there is nothing for them to read. The Indian women, who have much better access to reading matter in their own tongue, are reputed to be only eleven per cent. literate. As a means of communication the radio, then, is their only channel.

The Fiji Broadcasting Commission is fortunate in having the services of three women well qualified to present the broadcasts, with the assistance of a woman superviser to gather news, write scripts and generally advise.

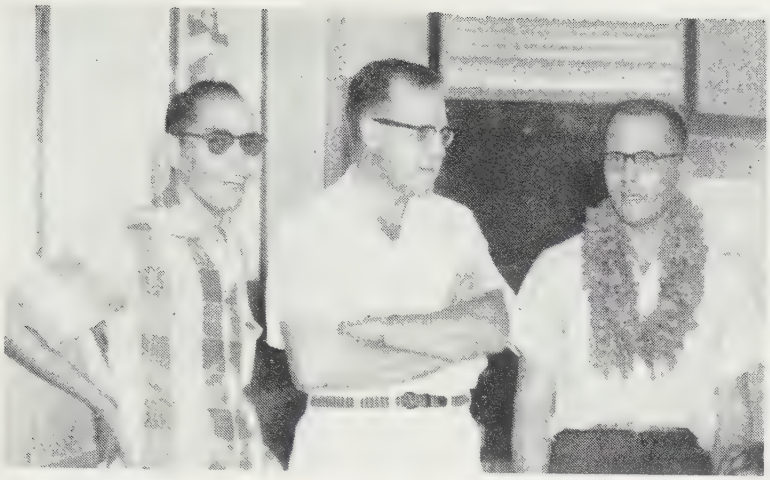
Mrs. M. R. Raymer is an Englishwoman with a flair for writing and considerable talent as an amateur actress; Viti Cokanasiga, mother of ten children and the wife of a veterinary field officer recently awarded the M.B.E. for meritorious service, conducts the Fijian sessions, and Mrs. Hassan, wife of Mr. Kalid Hassan, a Suva lawyer, holds a degree in Home Science from Cornell University.

All three women display a lively interest in each other's sessions, and freely exchange ideas in an endeavour to keep women of all races in touch with each other.

"Marion," "Viti" and "Bhangi" (Sister) as they are known respectively to their listeners, reflect the attitude held generally by women in Fiji who seek to co-ordinate and integrate people in the Colony regardless of race or creed.

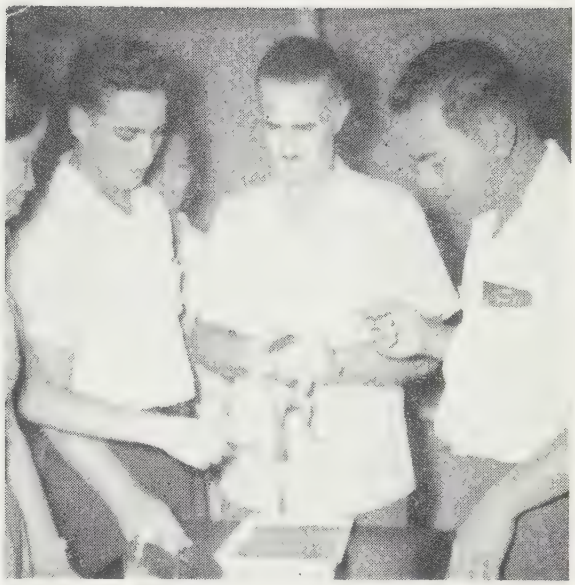
If, as a result of the investigation into the needs for adult education for women —conducted by the women themselves— other means of disseminating knowledge and enlightenment are found, they will be welcomed no less by the Fiji Broadcasting Commission than by the women themselves anxious to learn and to progress. A combination of both methods of education—visual as well as audio— is the ideal.

* Mrs. Lamont is Women's Session Organizer, Fiji Broadcasting Commission.



ABOVE: Dr. Pedro C. Sanchez, Dean of the College, and Mr. John R. Trace (centre), Director of Education for the Territory of Guam, greet a new staff member, Dr. Bennie Stehr (with leis).

BELOW: Architect's drawing of the new College, now being built. In the centre is the air-conditioned library; at right, 12-classroom academic building. The College overlooks Pago Bay on the west coast of Guam. The buildings and equipment will cost close on one million dollars.



Professor George M. Perdew (centre), pithing a frog in a class in biology.

The Territorial College Of Guam

Now being built on a new campus on Pago Bay overlooking the Pacific is the new home of the Territorial College of Guam, which was opened in 1952 as a centre of higher education for the region. It is expected that the College will move from its present temporary quarters to its new building in 1960.

By PEDRO C. SANCHEZ*

EMERGING as the centre of higher education in the western Pacific, the Territorial College of Guam is perhaps symbolic of the rapid development of the American territory of Guam. The Territorial College is an accredited two-year institution of higher education operated by the Government of Guam.

The idea of a college in this part of the world neared fruition in 1951, by authority of an Organic Act provision stressing a need for higher education and training facilities to enable Guamanians to participate fully in local government. Thus, the First Guam Legislature in one of its first official actions directed the Board of Education to consider means of making higher education available in the territory.

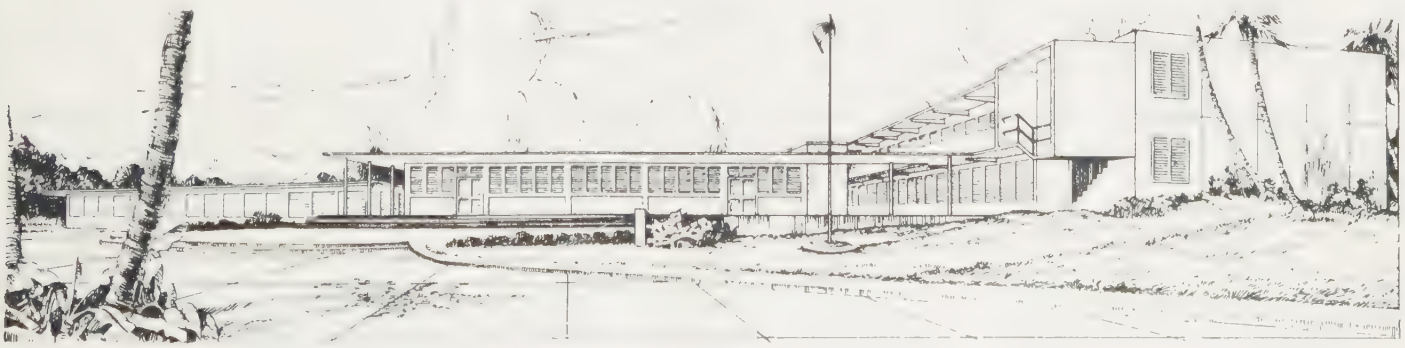
The College opened its doors for the first time in the summer of 1952, with an enrolment of 192 public school teachers. At this time the Ohio State University agreed to "sponsor" the Territorial College for five years, releasing every fifteen months a full professor to serve as college dean.[1]

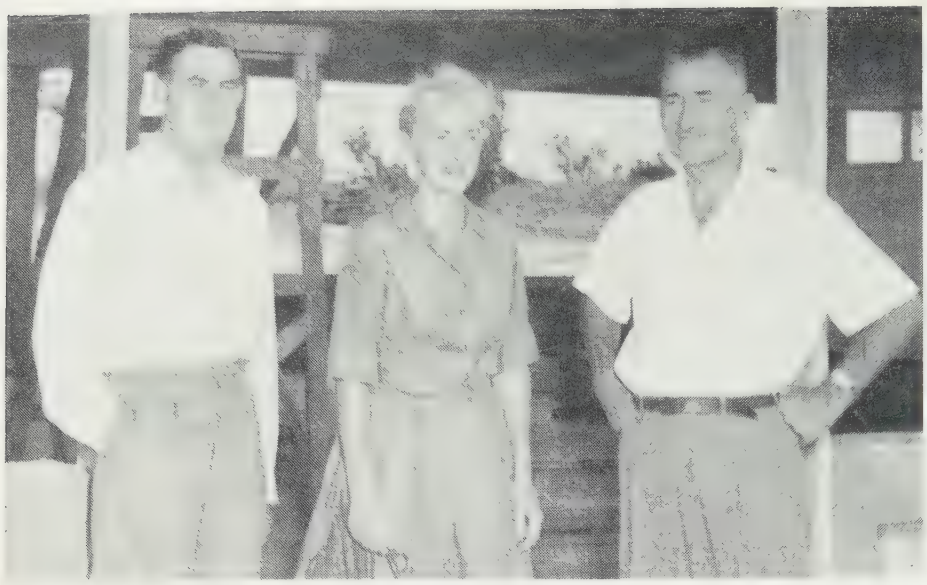
The College soon went beyond its original purpose of teacher education. A general academic programme in the fall of 1953 and a business education curriculum in the summer of 1956 were added. To-day the college offers Associate in Arts Degree programmes in business administration, teacher education, and general academics.

Since its initial opening the College has graduated 92 students with the Asso-

* Dr. Sanchez is Dean of the Territorial College of Guam.

[1] When in 1957 the agreement with Ohio State University was modified to authorize the Territorial Director of Education to appoint the college dean, the writer became the first local dean. Ohio State University now sends one consultant for a three-month period each year, for which services the University receives no monetary returns. Its personnel assigned to Guam formerly as dean and now as consultants were and are paid a salary by the Government of Guam. The services provided by Ohio State have been invaluable in the development of the Territorial College.





Inspecting the partly-completed College. Left to right: Dr. Richard Seddon, Executive Officer for Social Development, South Pacific Commission, Mrs. Gibson and Dr. Robert E. Gibson, Director of Education, Trust Territory of the Pacific Islands.

ciate in Arts Degree, most of them teachers. Enrolment has soared to over 500 students per quarter, including those enrolled in both part-time and full-time programmes. The regular daytime enrolment has jumped from 37 in 1953 to about 170 at this time. The increasing number of students from the islands of the United States Trust Territory indicates that the College will become "the centre of higher education in the Western Pacific." At least sixteen students on Trust Territory scholarships are enrolled at the institution. Over 1,250 students enrolled for courses during the school year of 1959.

The College is beginning to fulfil its responsibility of providing trained teachers for elementary schools by upgrading currently active teachers, and by producing each year a new crop of instructors. It is also providing the territory with trained secretaries, stenographers, junior accountants and other office workers. It provides two years of general education for those students going abroad for the Bachelor's degree or higher.

For a relatively small college of seven years, its operation is quite extensive. The school year is divided into three quarters and a summer session. Along with its regular daytime programme, late afternoon and evening courses are offered as well as non-credit vocational and adult education subjects. In addition to an off-campus centre at Anderson Air Force Base, where about 100 students enrol in college level courses, special classes are offered in areas such as typing, book-keeping, woodwork, radio, and a special programme for individuals preparing for naturalization. Too, the College offers such courses as art, Spanish, and others for which there are demands. This programme operates on a four-night-a-week basis.

Highly-Qualified Staff

As the Accreditation Survey Team pointed out in its report recommending accreditation, the staff of the College is highly qualified in terms of training and experience. Eight of the fourteen professors hold Doctor's degrees from American Universities; five have Master's degrees and one holds a Diploma of Education from Sydney University. The Evening Programme Director, the Librarian, and the Registrar hold Master's degrees. The Co-ordinator of Student Personnel Services and the Dean of the College hold Doctor's degrees. Two staff members took graduate studies in foreign universities. Four Guamanians are members of the College staff—the Assistant Registrar, two Assistant Professors, and the Dean of the College.

One of the Guamanian professors is currently on leave while working toward his Ph.D. in Science at Ohio State University under a fellowship granted by the National Science Foundation.

New Buildings Under Construction

Now rising on a beautiful campus overlooking the blue Pacific Ocean is the new home of the Territorial College. The plant, when completed, will cost about a million dollars in building and equipment. The first group of buildings includes a two-storey, twelve-classroom academic building, an air-conditioned library, and a student centre. Plans have been drawn for an administration wing to be added shortly. Housed temporarily in war-time quonset huts, the College is expected to move into its new building in 1960.

All in all, the future seems bright for the College. It has the support of the Executive and Legislative branches of the Government of Guam and the public in general. Accreditation assures the College that it has a sound programme of higher education and a firm foundation on which to build a four-year curriculum.

With a modern plant on a new campus, the College is prepared to provide a programme of education capable of meeting the challenges of the future. As it goes into a four-year institution, The Territorial College may see the day when it is recognized indeed as "the centre of higher education in the Western Pacific."

SPC Education Seminar Next Month

(Continued from page 23)

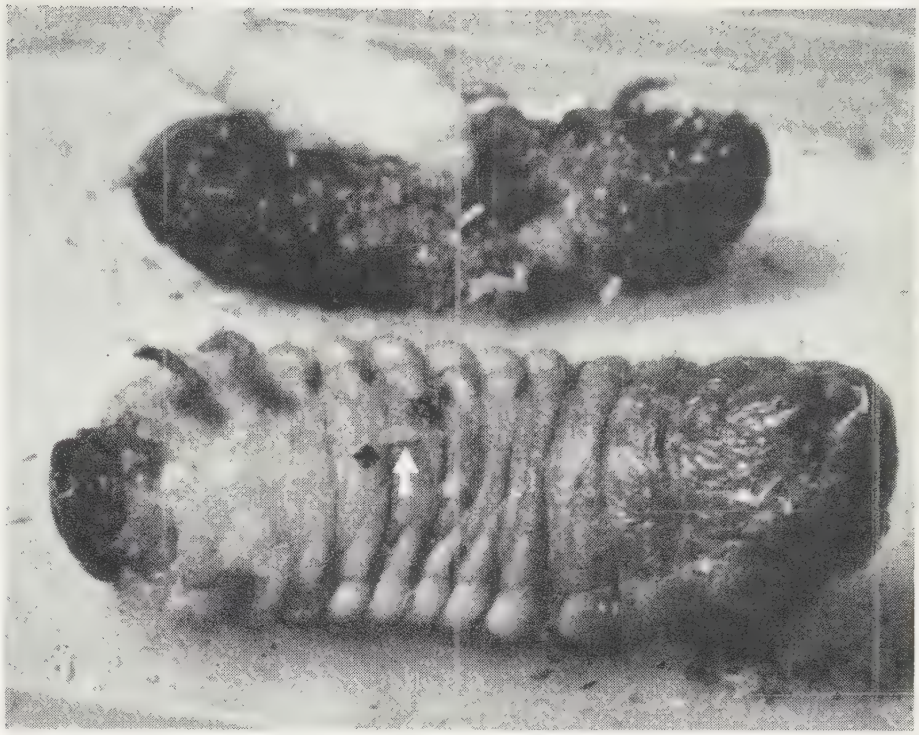
Principal speaker at the formal opening will be Professor Fred J. Schonell, Dean of the Faculty of Education in the University of Queensland, while Dr. Seddon will speak on behalf of the South Pacific Commission.

On page 23 are given the nominations of participants and observers received so far. It is interesting to note that all six of the Commission's participating governments will be directly represented, and that senior education officers will be present from no fewer than fourteen of the territories within the Commission's area of concern.

While recognizing the importance to general development of informal or out-of-school education, the Commission at its eighteenth (1958) session reached the conclusion that the Seminar should focus its attention on a carefully-selected number of inter-related problems in formal education which are of common interest and concern throughout the area.

In compiling the agenda the Commission had the benefit of a wide range of suggestions from Directors of Education and Senior Education Officers in the territories, and it is believed that the approved agenda which follows represents a most useful selection from the suggestions put forward.

1. *The provision of varying types and levels of education in relation to both:*
   (*a*) *a limited budget; and*
   (*b*) *the professional and occupational needs of a territory.*
2. *The training of teachers.*
3. *The place of an educational aids service in relation to an expanding educational system.*
4. *The methods of teaching languages.*
5. *The rôle of the Commission, and specific activities which it might undertake, in association with the territories, in the field of education.*



Scolia ruficornis attacks its host (Oryctes rhinoceros) when it is in its third instar, shortly prior to pupation, following the beetle grub far down into the soil. The egg (arrowed in photo) hatches within a few hours, and the growth of the larva (in background) is remarkably rapid, the whole period from egg to hardened cocoon taking only about nine days under equatorial conditions. After the cocoon is formed there is a diapause (a pause in growth) which may last anything from six weeks up to as many months or more. At present it is not known what breaks this diapause, but when prolonged it is accompanied by considerable mortality.

Further Note On

Scolia Ruficornis In Fiji

In this postscript to his article in the last QUARTERLY BULLETIN, *the author supplies a further note on developments in the experiment to introduce into Fiji a larval parasite of the rhinoceros beetle,* SCOLIA RUFICORNIS.

By HUBERT W. SIMMONDS*

IN the July *Quarterly Bulletin* the writer gave an account of the discovery and introduction into Samoa, the Palaus, and later into Fiji, of the Zanzibar scoliid wasp, *Scolia ruficornis,* a parasite of the African species of *Oryctes,* which was found to be capable of breeding upon the Asiatic species of that genus, *Oryctes rhinoceros.*

The accompanying photograph showing the egg and the larva of the parasite has been taken since that article was written.

The parasite had then been in Fiji only nine months, when it was imported in the pupal stage. In view of the irregular emergence of the adults from that condition and their subsequent long life of about four months, it can be assumed that most of the new cocoons found in the breeding heaps up to that date had originated from adults emerging from the original imported cocoons.

This number—300—was disappointingly small, and was probably due to the comparatively thin beetle population in Fiji, so that any wasp which had to travel far in search of food would in many cases fail to return to its own birthplace. Probably it would have to wander far before finding beetle grubs in a suitable condition for it to attack, with a liability to destruction during its search.

The number of new cocoons obtained has now risen to about 500 (September 7), which nevertheless is still very disappointing. The same factor is still operating and there is also reason to suspect that the introduced Indian bulbul, which definitely attacks the *Polistes* wasp, is concentrating about our breeding sites to capture our parasites.

Mongoose, which first attacked our compost heaps in a spell of dry weather, now definitely burrows into them in search of the beetle grubs. It has been found necessary to cover the compost heaps with 2-inch mesh wire netting until the time comes to place the ½-inch mesh covers on. Evidence is now accumulating that the ½-inch mesh covers do not stop the parasite going on down in search of its host, unless they are covered to a depth of 12 or 18 ins. with compost. (In this connexion it is interesting to note that once a female has entered a heap and attacked the grubs within, she will continue to return to the same heap, ignoring a similar heap only a yard away.)

Incidentally, I have not previously placed it on record, but mice enter the compost and remove grubs. I have seen a mouse carrying a grub almost as big as itself.

* Formerly Government Entomologist, Fiji.

SPC Scientist Studying Disease Of Coconut Pest

On October 2 the Commission's insect pathologist, Dr. Paul Surany, arrived at SPC headquarters by air from Kenya. For the past four years, aided by a Rockefeller Foundation grant, he has been studying diseases of the rhinoceros beetle (*Oryctes rhinoceros*) at his research headquarters near Nairobi.

He found that two diseases are mainly responsible for keeping the beetle population at a low level in South East Asia and East Africa. These diseases are not only found in rhinoceros beetles but also in other types of beetles, for instance the European cockchafer. However, much scientific research will be needed before the direct control of *Oryctes* through infectious diseases will be possible.

Dr. Surany will leave Noumea on October 10 to study beetle populations in certain infested Pacific Islands, notably Fiji and Western Samoa. The primary purpose of his tour is to survey diseases of the rhinoceros beetle in the Pacific islands. Indirect evidence suggests that one type of disease is present in Fiji, and the Senior Entomologist there, Mr. B. A. O'Connor, has a series of specimens ready for examination by Dr. Surany.

Dr. Surany has prepared a report on his work to date that will be published by the Commission early in the new year under the title, *Diseases and Biological Control of Rhinoceros Beetles.*

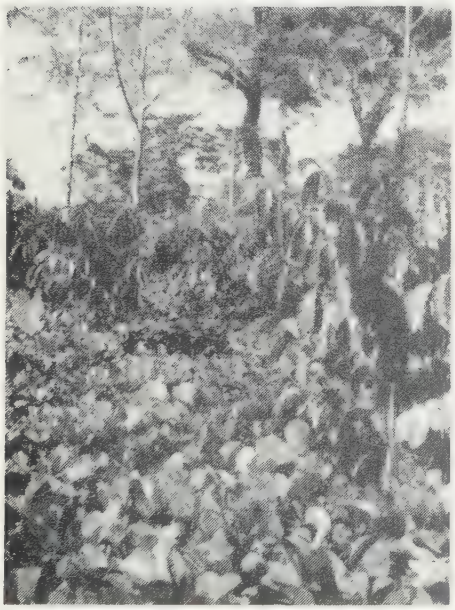


Fig. 1 (left): Robusta coffee, introduced from the United States in November 1957. Fig. 2 (centre): Young coffee growing under Sesbania shade, and with leguminous ground cover. Fig. 3 (bottom): Tea bush (Camellia thea) eighteen months old.

Plant Introduction In Western Samoa

The introduction of useful plants to Western Samoa has played an important role in its development. In this article the author, well known for his work in the plant introduction field in Fiji, reviews latest progress in Western Samoa following the establishment there in 1956 of the Nafanua Agricultural Station, which now functions as the plant introduction centre for the territory.

By B. E. V. PARHAM*

IN Western Samoa, as in other Pacific island groups, the history of plant introduction activities now covers a period of well over one hundred years. There is no doubt that before the arrival of Europeans, the Samoans themselves had made valuable contributions to the stock of indigenous food and ornamental plants; but with the arrival of the early missionaries and settlers there was a great increase in the number of species brought in from other countries, and this work has continued over the years.

Many of the older estates and mission stations as well as the original plant introduction garden established many years ago near Moamoa are still valuable sources of material for experimentation under modern conditions and methods. This brief survey, however, is concerned with more recent activities undertaken by the Department of Agriculture during the past three years at the Nafanua Agricultural Station near Apia.

Prior to 1956 very useful work was carried out on a part of the original Vailima Estate which was made available by the High Commissioner to the Department of Agriculture for experimental purposes. Introductions made during the period 1952-1956 were mostly propagated there; but the development of the area for forestry necessitated a move, and led to the establishment nearby of the Nafanua Station which now functions as the introduction, observation and propagation centre for the territory.

Nafanua Agricultural Station

This area covers approximately 20 acres of gently-sloping land lying between the Vailima River and Falealili Road. It is less than three miles from the headquarters of the Department at Savalalo in Apia. The altitude is approximately 450 feet.

The land had been fallow for a number of years and was covered with second-growth vegetation, trees, shrubs and lianes.

The soils were studied by the New Zealand Soils Survey Officer, Mr. A. C. S. Wright, in 1956-57, and comprise the Papauta and related soils—which are described as slightly stony to bouldery clays, moderately to very well drained; topsoils are clays and subsoils are silty clays of moderate and moderate-to-low fertility—and with the steepland soils (Vailima series) are well suited to orchard crops, cocoa, coffee, citrus, and to forestry and pasture development.

These soils are representative of considerable areas in Upolu and Savai'i which, with increasing population, now require special investigation to determine the best methods for their efficient utilization for production of food and cash crops or for pastures; and to some degree to establish their suitability for new crops not hitherto grown.

The Approved Programme

The approved programme for the station covers the following major activities:

(i) Collection and propagation of indigenous species of economic importance;
(ii) introduction and propagation of new crops or new strains and varieties for Western Samoa;
(iii) assembly of local selections of cocoa, coffee and other major crops which have been proved to be of high yield or resistance to disease;
(iv) development of improved systems for clonal propagation;

* Director of Agriculture, Western Samoa.

(v) distribution of seeds and clones;
(vi) field experiments and observations on major crops and soil fertility studies, pest and disease control;
(vii) demonstrations of selected projects;
(viii) processing trials and demonstrations;
(ix) training courses for staff, farmers, students from Avele Agricultural College and from other schools in the territory.

Installations And Facilities

Installations and facilities already established include:

Two plant propagator houses (one under construction); *shade house* for hardening and holding clonal material—with pit propagators;

Cocoa driers: One Trinidad smallholder (sun drier) and one Samoan drier (Cadbury design);

Copra driers: One single-unit open-hearth drier (Ceylon type); one double-unit open-hearth drier (constructed of treated kapok timber) and one "Perfect 50" patented hot-air drier;

Fumigators: One vacuum cylinder (100 cubic feet)—Fig. 13—one atmospheric vault (2000 cubic feet) and one incinerator.

Storage for equipment and materials, together with office and laboratory accommodation, are provided in a steel-framed building 60′ x 30′; while for staff and grower meetings a large, well-built Samoan fale is available. Seventy chains of 12-foot roads give access to 17 measured fields grouped in four main blocks protected by 80 chains of pig-proof fencing and 40 chains of hedges. The layout corresponds with the general distribution of soil types and with the topography. A fish pond (700 square feet) is maintained for studies with *Tilapia*.

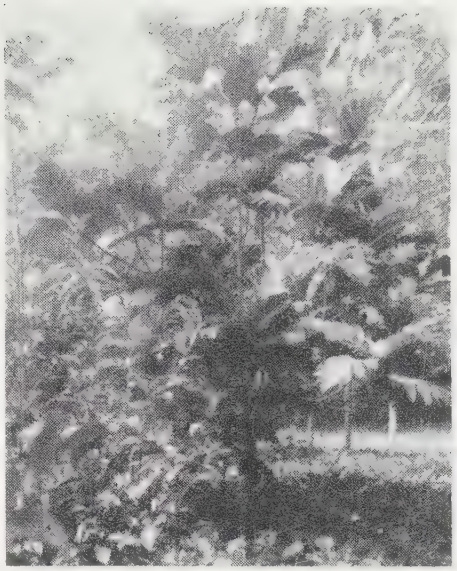


Fig. 4 (above): Breadfruit (Artocarpus), two years old. Note tea bush in foreground. Fig. 5 (right): Manilla hemp (Musa textilis), introduced from Fiji in 1956.

The Plants

During the period April 1956-June 1959, 330 introductions were registered. In addition there have been established many plants, useful or ornamental, obtained from local sources; and certain outstanding Samoan trees have been retained in their actual sites.

The species catalogue contains approximately 400 items; only a few of the more important plants are described in the following notes, which have been recorded in the Annual Reports (1, 2, 3) and in the monthly Circular (4).

Cacao: (*Theobroma cacao* L.) 29 introductions representing an important series of clonal material of *Amelonado* and *Trinitario* strains including G.S.29, G.S.36, ICS 39, ICS 40, ICS 60, ICS 89, ICS 95, ICS 98, NA 32, PA 35, S535, also 13 of the Papua and New Guinea seedlings. In addition a collection of local strains selected by Dr. Harvey Smith, D.S.I.R. New Zealand, for resistance to canker and blackpod disease have been established from rooted cuttings. Nurseries of 200 clonal plants Lafi 7 and of other clones are now well established and in use for further propagation (Fig. 11). A plot of cocoa in bearing provides material for experimental control of blackpod and for trials in fermenting and drying (Fig. 12).

Coffee: Twelve introductions have been recorded and many plants established. These include seedlings of 8 species received from the United States Department of Agriculture's Plant Introduction

Fig. 6 (left): A field of tropical Kudzu (Pueraria phaseoloides) with heavy crop of seed. Fig. 7 (centre): Indigofera teysmanii, introduced from Singapore in 1956. Note Bixa hedge in foreground. Fig. 8 (right): These bamboos, now eighteen months old, were introduced from the United States.

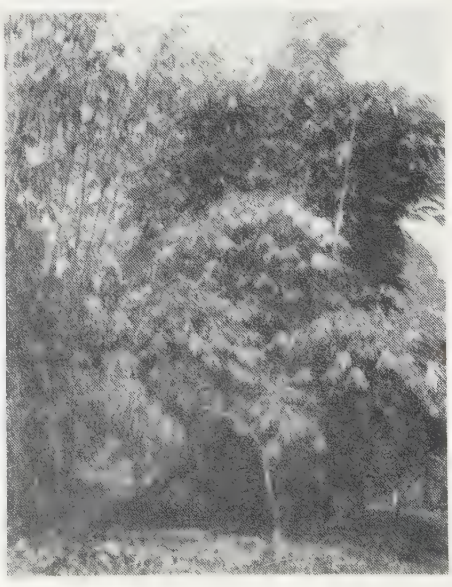


Fig. 9 (above): Poumuli trees (Securinega samoana), fifteen months old, under-planted with Ta'amu (Alocasia). Fig. 10 (right): Yemane trees (Gmelina arborea), twelve months old, introduced from Fiji.

Service by arrangement with the SPC Plant Introduction Officer. They are:

Coffea abeokutae, C. arabica (Barbuk Sudan), *C. bengalensis, C. canephora* (2 strains), *C. eugenoides, C. liberica, C. robusta* and *C. stenophylla.* (Figs. 1 and 2.) Plots of local strains of *C. arabica* have been established for studies in pruning, fertilizers and processing.

Tea: Five hedges of tea (*Camellia sinensis*) have been established. (Fig. 3.)

Root Crops: Considerable attention has been given to the collection for varietal studies of many types of dasheen and taro (*Colocasia*), ta'amu (*Alocasia*), pula'a (*Cyrtosperma*), ufi (*Dioscorea*), umala (*Ipomoea*) and the arrowroots (*Maranta* and *Canna*). These collections are progressively increasing due to the active interest of field staff who continue to seek out and bring in varieties not already established.

Cereals: There have been 5 introductions of rice, all from the Department of Agriculture, Fiji, and including some of the solid stem types—Reyong, Radinsiak. Serendah kurung. These have grown very well.

Seed of sweet corn USDA 34 is produced from regular plantings for distribution throughout the territory.

Other Food Crops: Other food crops comprise breadfruit (7 varieties) and tapioca (1 variety) and fruit trees as citrus, avocado, mango, soursop, papaya, acerola, granadilla and passionfruit (commercial type) have been planted and many of these are now in bearing (Fig. 4).

Bananas have a special place on the programme and much useful experimental and demonstration work has already been carried out on the station. The fertilizer and the pest and disease control trials have produced valuable results which are being applied in the field by extension services. Manila hemp (*Musa textilis*) from Malaya via Fiji, *M. banksii* and several varieties of Plantain are being grown (Fig. 5).

Vegetables grown for yield trials for seed production and for experimental marketing are cauliflower var. *Puakea,* tomato vars. *Amahu* and *Manalucie, Capsicum* eggplant and spinach. The valuable *Saccharum edule* is represented by several introductions from Fiji.

Spices: Several introductions of black pepper (*Piper nigrum*) have been made; and also established and growing are kola (*Cola acuminata*), nutmeg (*Myristica fragrans*), ginger (*Zingiber officinalis*).

Pasture and Fodder Plants: Established pastures in the territory are composed mainly of a few species of mediocre value, e.g.:

Axonopus compressus, Paspalum conjugatum, P. paniculatum, Mikania micrantha and *Mimosa pudica.*

There is much scope for development of improved pastures because of the increase in the livestock population and the opening up of much new land at higher elevations. Consequently, special attention has been given to the introduction and distribution of grasses, legumes and other fodder species and more particularly to those of proved value elsewhere in the tropics. Already there has been a very considerable area of new pastures established from seeds and plants supplied from Nafanua—where plots are maintained for seed production. The principal species grown include:

FODDERS: Elephant grass (*Pennisetum Purpureum*), Guatemala grass (*Tripsacum laxum*), Ramie (*Boehmeria nivea*), *Desmodium* spp.

GRASSES: Batiki blue grass and Falefa grass (varieties of *Ischaemum indicum*), Java grass (*Polytrias praemorsa*), Coastal Bermuda grass (*Cynodon dactylon* var.) *Paspalum dilatatum.*

LEGUMES: (Fig. 6) Puero (*Pueraria phaseoloides*), Centro (*Centrosema pubescens*), Stylo and Townsville lucerne *Stylosanthes gracilis* and *S. sundaica*), *Medicago sativa* (African lucerne)—and several species of *Desmodium.*

The use of leguminous shrubs and trees for supplementary fodder in grazing areas or for shade is being developed and for this purpose many leguminous trees are being raised. These include *Erythrina* (3 species), *Albizzia* (2 species)—*Sesbania, Gliricidia* and *Indigofera.* (Fig. 7.)

Bamboos: Bamboos and thatch plants are well represented by a collection of selected species received from the United States Department of Agriculture, Plant Introduction Service in November 1956 and from other sources (Fig. 8). The bamboos which have made vigorous growth are:

Bambusa textilis, B. tuldoides, B. ventricosa, Gigantochloa verticillata and *G. apus,* also from local sources *Bambusa vulgaris,* and *Schizostachyium glaucifolium.* Thatch plants are the sago palm (*Metroxylon* sp.) and the "Ragnar" variety of sugarcane.

Hedges: For demonstration purposes, hedges of different species have been

Fig. 11 (above): Clonal cocoa, two years old. Fig. 12 (right): Cocoa tree in bearing; local strain with high yield.

Vacuum fumigator for pest control treatment of plants and produce.

established along boundaries and to separate fields. The species used include *Bougainvillea, Lawsonia inermis, Bixa Orellana, Solanum ornans, Hibiscus manihot* and *H. rosa-sinensis.* Most of these are stock-proof when properly pruned and already provide a conspicuous feature in the layout of the station. *Hibiscus manihot,* or pele, is a valuable spinach plant which is not widely used in Samoa but which is proving useful for introduction to the gardens of boarding schools.

Forestry: The Department is actively engaged in propagating and distributing useful timber trees, both indigenous and exotic, for village planting and is also planting up extensive areas of water catchment reserves in Upolu. At Nafanua, the steep stream banks have been planted with large numbers of poumuli (Fig. 9), Yemane (Fig. 10) and some tamanu (*Calophyllum samoense*), and malili (*Terminalia richii*) while large numbers of these species have been raised in nurseries for distribution. Other species used are *Cedrela odorata, Albizzia falcata, Swietenia macrophylla, Cassia siamea,* and indigenous species of *Parinarium, Calophyllum, Pometia, Afzelia* and *Palaquium.*

Cover Crops and Shade Trees: Some 20 species, many new to Samoa, have now been established and are under observation. These are expected to play a major role in the conservation and rehabilitation of the fertility of Samoan soils.

Ornamentals: While the inclusion of foliage and flowering plants in plant introduction programmes has been criticised, there is no doubt that in Western Samoa where flowers flourish, there is a demand for ornamental plants and especially for new or uncommon species. Consequently these are not altogether neglected; and among the outstanding plants which have now become established are the following: Timor shower (*Cassia multijuga*), *C. spectabilis, Bauhinia violacea, B. hookeri* and *B. rosea,* Rose of Venezuela (*Saraca* sp.), *Brownea* sp. *Galphimium, Eranthemum* and *Franciscea americana.* Many of the most useful plants on the station, e.g. frangipanni for Vanilla supports, *Sesbania* for shade, *Bougainvillea, Bixa* and *Lawsonia* as hedges, might also be described under this heading. The sale and exchange of these plants make a useful contribution to the work of the station.

The progress made during the past three years owes a great deal to the interest and support afforded to the station by the Ministers of Agriculture and the Government of Western Samoa. A great many of the important crop plants now being grown came from the Department of Agriculture, Fiji, the United States Department of Agriculture, Plant Introduction Service and the Royal Botanical Gardens at Singapore.

Pearl Shell In French Polynesia

(Continued from page 33)

descent and reach an average depth of 20 fathoms, or 120 feet.

When he has reached the bottom he lets go the rope and makes for the shells which he has already been able to single out during the last few fathoms of his descent. They are conspicuous because of their serrated edges or through the crescent-shaped black lips of their mantles.

The diver swims with slow strokes, sometimes gliding from shell to shell or from rock to rock. With a swift half-turn he wrenches the shells from their support and deposits them in the basket. Later, he will use the basket rope to haul himself up to the surface. On an average, he stays under water for 1½-2 minutes.

When he has reached the canoe and inhaled his first breath of air, he dips his head into the water again and remains thus, shoulders hunched, for a few more seconds.

Then after a 5 or 10-minute rest during which he refreshes his lungs by singing, calling or whistling, he dives again. In turn he explores all the rocks within a 15-feet radius of the basket. Then a few fathoms of the rope fastening his canoe to the buoy are paid out, and his underwater search proceeds, gradually, along a 30-feet wide channel.

When diving is over or the basket full the shells are opened, cleaned, scraped and dumped in the bottom of the boat.

The diver's return to the village is the big event of the day. Each fisherman is eagerly awaited by his vahine who, following the custom, is entitled to a few of the better shells, the proceeds from which will keep the home going and bring her in a little pocket-money.

The diving contractor supervises the unloading of the shells and their transport to his warehouse where, after a further checking for size, they are stacked neatly, face downwards in orderly piles.

I may add, in conclusion, that the hard and dangerous work of diving for pearl shell is not confined to youth as shown, for instance, by the case of Louis Masui who is a very good diver indeed and who, at over fifty, can still go down to 22 fathoms, or 132 feet. (Younger divers can manage 24 or 25 fathoms.)

This year he elected to work at 20 fathoms. The last time I met him—in April—he was regularly going down to around 105 feet, and would normally remain under water for 2½ minutes (one of his checked times was 2 minutes 42 seconds). That particular day he was working alone. Said he: "My young mate probably spent the night at the pictures, or playing billiards, or serenading some girl"—and added philosophically *"Aita peapea* (it does not matter) I can dive alone".

New Hospital For Netherlands New Guinea

(Continued from page 39)

The oldest established division of the Public Health Services in the territory is the Division of Malariology, which is housed near the entrance to the Central Hospital.

The building of the new hospital and the headquarters of this Division were combined in the one project. Offices for the medical officers, the entomologist and administrative personnel, besides two laboratories and a "mosquito nursery", have been built.

The main task of the Division is malaria control, but as a logical consequence much attention is paid to research. Modern malaria control necessitates the study of the habits of the vector mosquitoes, as well as their reaction and susceptibility to insecticides.

Because the main vectors of malaria in Netherlands New Guinea also transmit filariasis, a subdivision for filariasis research is established within the Division.

The entomologist of the Division is making a collection of mosquitoes occurring in Netherlands New Guinea. This will serve as a reference for the virus research laboratory to be established shortly. By then, presumably, there will be a major interest in possible vectors of some virus diseases.

In the laboratory is given a three-year course for training of indigenous malaria technicians. Pupils with at least six years of elementary school training are admitted. They are trained to assist the malariologist and the entomologist in epidemiological, parasitological and entomological work. After qualifying, they are capable of diagnosing all types of malaria parasites, of dissecting mosquitos for sporozoëtes and determination of some common mosquitoes occurring in this territory.

Tuna Fishing Investigations In The South Pacific

The "Orsom III", fisheries research ship of the French Institute of Oceania, ready to leave on a survey voyage, arouses the interest of a New Caledonian.

The commercial possibilities of tuna fishing in waters around French territories in the Pacific are promising, according to recent investigations made by fisheries research vessels of the French Institute of Oceania, Noumea, and Pacific Oceanic Fisheries Investigations, Honolulu.

By MICHEL ANGOT*

THE French territories of the Pacific include the following groups of islands: *French Polynesia*, with the Windward Islands (among which is Tahiti), the Leeward Islands, the Gambier, the Austral Islands, the Tuamotus and the Marquesas; *New Caledonia and Dependencies*, comprising New Caledonia, the Loyalties, Wallis and Futuna; and *The Condominium of the New Hebrides*, which is administered jointly by France and the United Kingdom.

New Caledonia excluded, these territories are very broken up, and each group can be regarded as a little world within itself. Given such geographical conditions one would think that the social pattern of life would depend, to a large extent, on an active intercourse by sea between the various islands, resulting in the development of fishing.

Oddly enough, fishing is either non-existent or practised on such a small scale that it does not even provide the population with sufficient high-protein foods, and one faces a situation where the indigenous people buy and consume tinned goods such as beef and sardines, in spite of the fact that they dwell near excellent fishing grounds.

Certainly this was not so before the Europeans settled in the region. But the indigenous populations have now discovered the miracle of tinned goods which provide them with readily-available food requiring no preparation, and the added advantage of the thousand and one uses to which the empty containers can be put. Thus, both Melanesians and Polynesians soon came to prefer the purchase of tinned foods to the often-laborious activities involved in fishing.

From the social, economic and health aspects, this development is bad indeed. It is imperative to rekindle the urge to fish among the people, so that they may use the local resources of the sea and consume fresh, high-protein foods without needing to import their equivalent in tins.

One could, of course, think in terms of small-scale fishing activities by local units—the family, clan or tribe—but this is rather contrary to the modern world trend. Should these units succeed in their efforts, the result would be that the indigenous population would be able to meet their own needs, but only through such varied and specialized ways as to preclude any large-scale development. In short, local fishing would be back to where it stood before the Europeans arrived. It seems unlikely that people who have chosen to give up their old ways in the course of nearly one hundred years should suddenly pick them up again with enthusiasm.

What does seem possible, however, is to arouse a new interest in fishing by introducing these island people to methods hitherto unknown to them. In

The "Orsom III", 75 feet long, is driven by a 135 h.p. engine, with sails providing auxiliary power. Here she is shown trolling off Noumea with lines from outriggers.

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doing so one should consider types of fishing which will not only meet the local food requirements, but also lend themselves to further large-scale development for commercial purposes. This would be in keeping with the general world trend and, by providing trained and experienced fishermen, would enable territories to develop local techniques easily employable by whatever social unit was involved.

In short, instead of reviving obsolete fishing methods—which certainly served their purpose but were necessarily limited in scope because of their high specialization—it would be better to open up new fields so that the people concerned may, in the course of their technical evolution, first meet their immediate food requirements and also eventually develop a large-scale industry which would benefit their general economy.

Tuna fishing answers all the problems which are considered to be urgent. It can be done on a small scale to provide food, and on a large scale for commercial purposes. Furthermore, tuna is found in all the waters surrounding the French Pacific territories and, in fact, in all tropical and equatorial seas. It is, therefore, quite obvious that any organization whose aims include technical and scientific assistance to territories in the Pacific should give top priority to the scientific study of tuna and to the investigation of the best methods of catching it.

Yellowfin tuna and Spanish mackerel taken by the "Orsom III" while trolling in New Caledonian waters.

Below: The yellowfin (Neothunnus macropterus) is an ideal fish to take by trolling.

Such a body is the French Institute of Oceania, and the research work carried out in its oceanographic laboratory is devoted primarily to the tuna.

When work was started, tuna fishing was either non-existent as in New Caledonia and Dependencies, or practised only on a very small scale, as in some parts of French Polynesia. It was therefore necessary to proceed by the following steps: firstly, the location of fishing grounds with a potential commercial value by determining the physico-chemical and biological characteristics of the marine environment; secondly, a detailed study of the tuna population suitable for commercial fishing; and lastly, an investigation into the practical commercial possibilities of tuna fishing in the area, through trials carried out with fishing gear as similar as possible to that which would be used eventually by a fishing fleet.

To carry out such an enormous task the Institute has at its disposal only a small survey ship, the ORSOM III, 75 ft. long, powered with a 135 h.p. engine. This vessel is obviously not large enough for the long-range cruises required to survey the vast expanse of ocean surrounding French Polynesia. She is, however, suitable for shorter regional cruises such as those undertaken from New Caledonia, and it is in these waters that the Institute has conducted its research work.

On the other hand, long-range ocean-going survey ships attached to Pacific Oceanic Fishery Investigations (P.O.F.I.), an American research organization based in Hawaii, have recently undertaken similar studies in French Polynesian waters.

From the combined data thus collected, it is now possible to draw practical conclusions of considerable importance to the eventual development of tuna fishing in these areas.

The research work carried out by the French Institute of Oceania in New Caledonian waters, and by Pacific Oceanic Fishery Investigations in French Polynesia, is analysed below.

Findings In New Caledonia

The ORSOM III started cruising for the French Institute of Oceania at the beginning of 1956. Since then she has been on 26 scientific cruises to investigate the tuna problem. During 14 of these, samples of sea water were taken at various depths down to 1,000 metres, and the analysis of these samples has established the characteristic features of the marine environment.

Nine other cruises were devoted mainly

The skipjack (Katsuwonus pelamis) is a species of tuna frequently caught by trolling.

to experiments in tuna fishing with longlines. During each cruise, up to 13 trolling lines were put out whenever the ship was under way, and useful information concerning tuna schools was collected.

Apart from the cruise "Equapac" during which the ORSOM III crossed the Equator and called at Tarawa in the Gilbert Islands, research work was concentrated in the area bounded by the Solomon Islands in the north, the New Hebrides in the east, the line Guadalcanal-Chesterfield in the west and the Norfolk Island parallel in the south.

The most important oceanographic cruises were given the following code names: "Equapac" and "56-5" (September-November 1956), "Astrolabe" (April-May 1958), "Boussole" (November-December 1958) and "Choiseul" (May 1959). From the data collected during these voyages, a picture is beginning to form of the main features of the marine environment, ranging from the physico-chemical properties of the sea water to an estimation of the population of pelagic fishes such as tuna; also the utilization of inorganic salts through photosynthesis which transforms them into phytoplanktonic living matter by means of solar energy, this phytoplanktonic living matter being food for the zooplankton which in turn provides the staple diet of marine creatures higher up in the animal scale, such as fishes and whales.

It has now been established that, due to the southward movement of warm equatorial waters, the productive capacity of the sea around New Caledonia is higher towards the end of the austral spring than at any other time of the year. This fact can be confirmed empirically by checking on the fishing grounds visited by the Japanese vessels of the Tuna Fishing Company established in Santo (New Hebrides). They will be found further south in November/December than during any other month.

On the practical side, one important fact which is of immediate value was noticed during all the ORSOM III cruises. Very few schools of tuna were spotted on the surface, and this was confirmed by the absence of flocks of birds which would normally be feeding on the same prey as the fish. This negative aspect of the data collected is sufficient to establish that tuna fishing with live bait is impossible, as this method is of commercial value only where surface schools are found in numbers. In any case, tuna fishing with live bait would have had no future because there are not enough of the small fish used as bait. The bays around New Caledonia have been explored systematically, and it has been found that the population of such fishes is not sufficient to provide the quantities required for any extensive tuna fishing.

The only methods suitable for tuna fishing in New Caledonian waters are, therefore, trolling for the species found in the vicinity of the reefs, and longlining for deep-swimming tuna.

The study of tuna behaviour in this particular area was therefore sufficient to determine which methods could be used for their capture. It still remained to find out the practical commercial possibilities of such fishing.

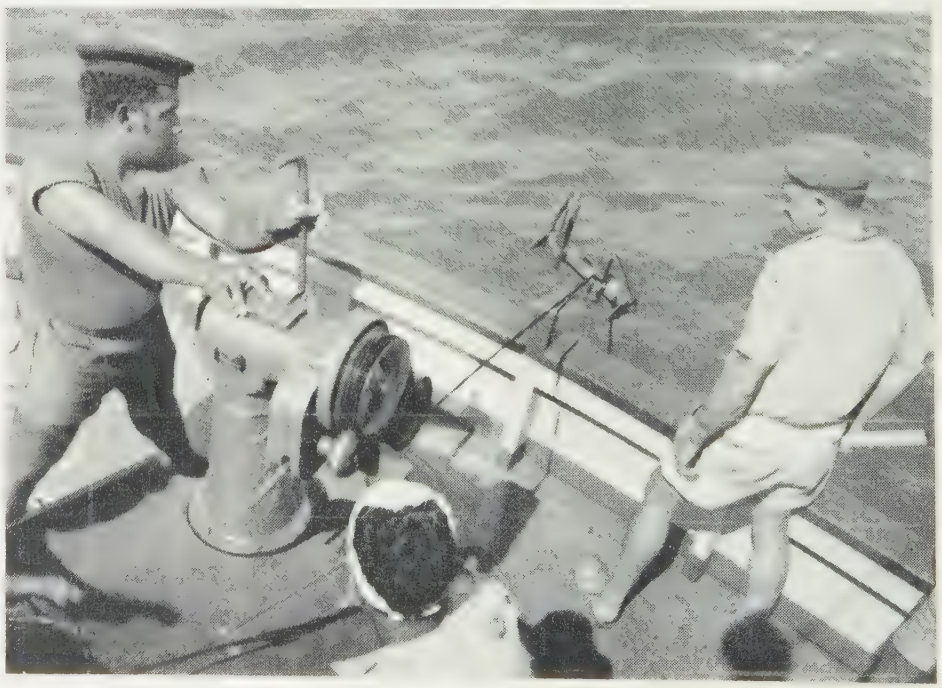
The ORSOM III was rigged up for trolling along the lines of a Breton fishing craft. (The technical details will be found in the French Institute of Oceania publication: *Possibilités de Pêche Artisanale du Thon en Nouvelle-Calédonie* by R. CRIOU, Nouméa, June, 1959.)

The area under consideration was explored systematically, and it was proved that schools of tuna are to be found near the surface—and therefore within reach of trolling gear—only in the vicinity of land. This applies to New Caledonia and the Loyalty Islands as well as to the New Hebrides.

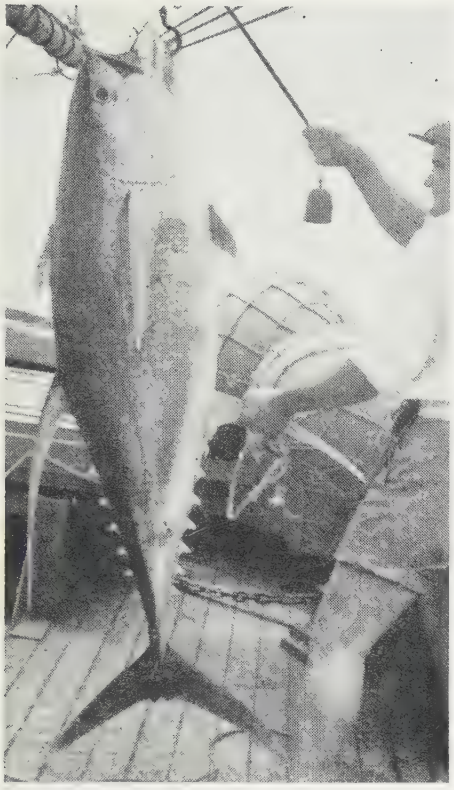
The main species caught was the yellowfin (*Neothunnus macropterus Schl.*). Average weight was 18 lbs., although some fish tipped the scales at 100 lbs. They were found mostly just outside the reefs and in the passes, but occasionally well within the lagoon.

The skipjack (*Katsuwonus pelamis* L.) were caught mostly out of sight of shore. Their average weight is 6 lbs. and they seldom exceed 20 lbs. The black skipjack (*Euthynnus alleteratus* Ruf.), which weigh from 4 to 10 lbs., are plentiful in the lagoons, but they are not highly valued because of their very dark flesh.

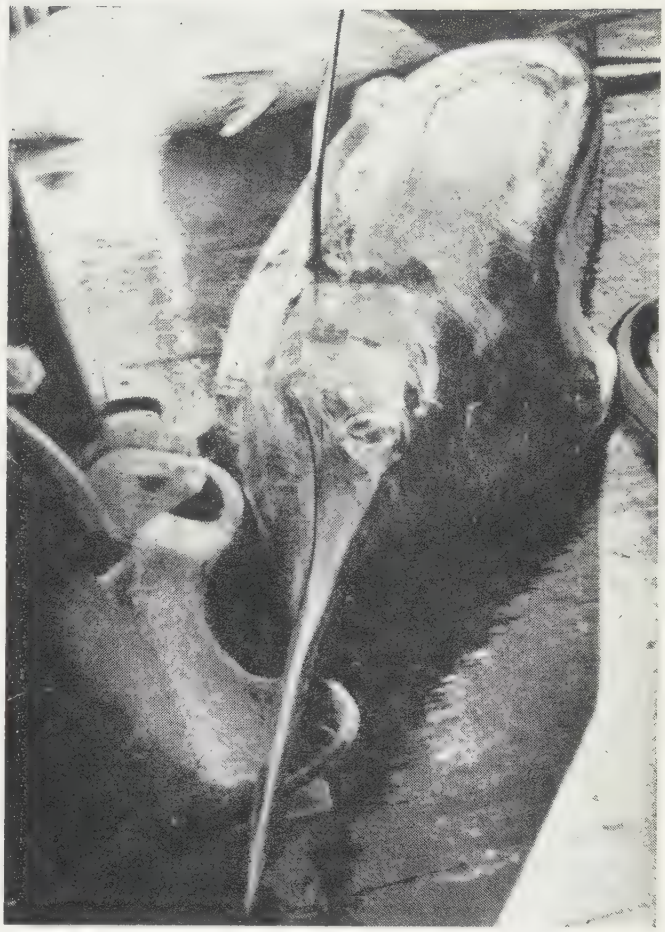
Apart from these fishes, which are true tunas, trollers will also readily catch the



The longline is hauled on board the "Orsom III" by a special winch.



Left: A yellowfin tuna weighing 160 pounds, caught on a longline.



Right: A 420-pound blue marlin taken on a longline by the "Orsom III".

Spanish mackerel (*Cybium commersoni* Lac.), the wahoo (*Acanthocybium solandri* Cuv.), which commonly weigh up to 50 lbs., and the dolphin (*Coryphaena hippurus* L.), weighing an average of 8 lbs. and whose flesh is highly valued.

The first two species mentioned are the only ones which can be considered as tunas for commercial purposes. The catches of these fish by the ORSOM III were frequently very satisfactory, i.e. 1.5 tons in less than 24 hours off the St. Vincent, Uitoé and Isié Passes in February 1956; 820 lbs. in a few hours off Bourail in May 1957; 1.4 tons in one day near the north-west coast of Lifou in August 1957, and 700 lbs. in a few hours between La Havannah and the Woodin Canal in January 1958.

From the analysis of the overall catch made by the ORSOM III it has been proved that the waters surrounding New Caledonia and Dependencies are quite rich enough to support a trolling fishery, provided it does not develop beyond a certain degree. Small-scale fishing is, therefore, very desirable and it is gratifying to note that the Institute's investigations have not been made in vain, since several local fishermen have rigged their boats with trolling gear and are now catching sufficient tuna to supply the small demand of the Nouméa market. This is proof enough that this type of fishing is commercially sound, and that it could be extended to other coastal towns in the territory.

To study deep-swimming tuna, the ORSOM III had to be equipped with special gear for longlining. (For technical details see the French Institute of Oceania publication *La Pêche du Thon à la Longue-Ligne,* by M. ANGOT and R. CRIOU, Nouméa, September 1959.)

The results of various surveys seem to indicate that fish which can be caught by this method are regularly found throughout the year in a zone west-southwest of Nouméa.

The main species is the albacore (*Germo alalunga,* Bonn.) whose average weight is approximately 40 lbs. In these waters it is caught mostly on the deepest hooks of the longline because it lives in water below 68° F. which, in the tropics, is found at a depth of approximately 500 ft.

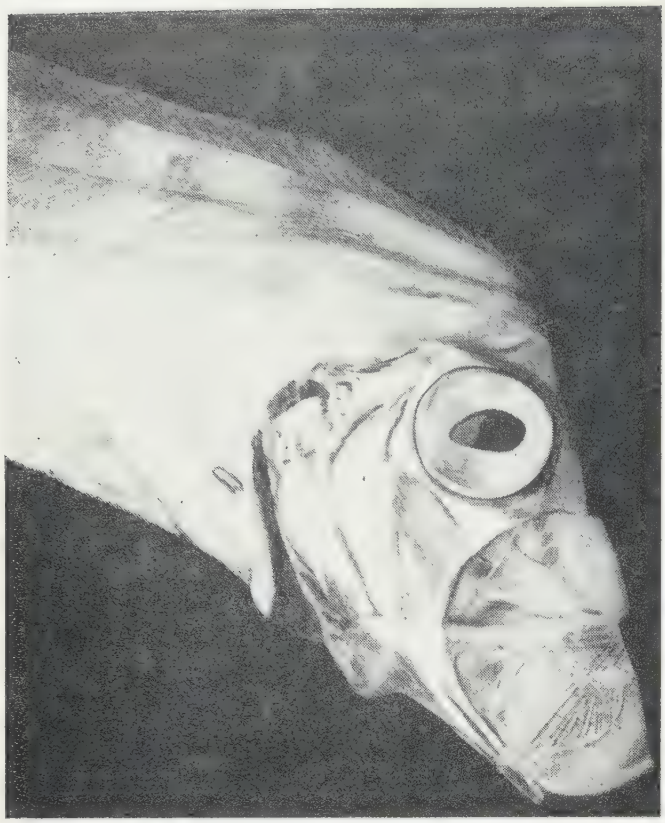
Two other species of tuna can be caught with a longline, the yellowfin and the big-eye (*Parathunnus mebachi* (Kish.)). The yellowfins caught with a longline are much larger than the surface ones brought in with trolling lines. They average 100 lbs. in weight and sometimes go up to 160 lbs. The big-eye weigh approximately 120 lbs., but sometimes 200 lbs.

Apart from tuna, many species of swordfish are caught, such as blue marlin (*Makaira ampla* (Poey)), striped marlin (*Makaira audax* (Phil.)), spearfish (*Tetrapturus* sp.) and swordfish (*Xiphias gladius,* Linn.). All these vary in size and their weight ranges from 60 to over 500 lbs.

Other longline catches include many species of sharks and a whole group of deep sea fishes rarely seen before such as the lancet fish (*Alepisaurus* sp.), the King-of-the-herrings (*Trachypterus* sp.) and other kin species.

The longline catches made by the ORSOM III have varied considerably since the first trials were undertaken. These fluctuations were not due to any alteration in the population of the fish it was intended to catch, but rather to the adjustment to a new technique required from part of the crew, and also to the rigging of the ship for a duty for which she had not been designed.

After the inevitable trials and errors, the scientific and technical staff of ORSOM III finally succeeded in obtaining valuable information concerning the commercial possibilities of longline fishing in the area under consideration. This in-



The head of a "King-of-the-herrings" (Trachypterus sp.), a little-known deep-sea fish taken on a longline.

formation, however, is the result of experimental fishing only, and should be regarded as a guide, not as a certainty.

Bearing that in mind, it seems that longline fishing around New Caledonia could be undertaken on a commercial basis, provided it was done at fifty or more miles from the reef in order to avoid the shark-infested waters close to the shore. These predators are only too often responsible for badly-damaged lines or mutilated fish which are brought in too severely mauled to be usable.

The ORSOM III catches which were commercially sound included 45% albacores, 27% yellowfins, 15% big-eyes and 13% swordfish. These figures were calculated during trials which took place west-south-west of New Caledonia in January and in May 1959. The maximum yield was 5 fish per 100 hooks and an average yield of 3%. The average weight of the fish was 80 lbs.

These results compare favourably with those obtained by the Japanese fishermen based on the Santo factory in the New Hebrides. Pending the findings of a systematic survey still in progress, it seems possible that longline fishing could be carried out on a very large scale in the waters of the territory under consideration.

P.O.F.I. Findings In French Polynesia

Pacific Oceanic Fishery Investigations sent out three transoceanic survey vessels, the HUGH M. SMITH, a converted tuna-clipper, the JOHN R. MANNING, a converted purse-seiner, and the CHARLES H. GILBERT, a ship especially built for research work, both theoretical and practical.

These three ships cruised in the waters of French Polynesia during the periods shown in the Table below.

The oceanographic data collected during these cruises is still being tabulated, and the results are to be incorporated into a general survey on the hydrology and the planktonic animal and plant life of the Pacific Ocean. The first two cruises of the HUGH M. SMITH were part of an international project in oceanographic research work in which the U.S.A., Japan, U.S.S.R., Canada and France participated. The 1955 cruise was known as "Eastropic" (in which the writer took part on board a ship of the Scripps Institution of Oceanography of the University of California, which surveyed the American offshore area from California to Peru). The 1956 cruise was termed "Equapac" (the ORSOM III covered the area between New Caledonia and the Equator, and the writer was in charge of productivity research on board the HUGH M. SMITH).

The first results of these cruises indicate that, around the Marquesas Group, the sea-water concentration of inorganic phosphate and zooplankton is higher during the austral winter than during the summer. Observations conducted at the same time on surface schools of tuna show that there were approximately three times as many during the summer as during the winter, the time of the cruises being August-September 1956, and January-March 1957.

From then on, all the research work was centred around the area of the Marquesas waters comparatively near to San Diego, in anticipation of the eventual setting-up of a tuna-fishing campaign to be carried out by the long-range units of the American tuna-clipper fleet. Another observation came as a further encouragement to this possible endeavour: from the very first cruises around the Archipelago, shoals of small fish suitable for live bait were observed close in to shore.

Research was organized systematically to solve two questions. First, how plentiful were the surface schools of tuna and would it be possible to catch them with live bait, and second, how plentiful were the deep-swimming tuna and would it be possible to catch them on a longline?

The first question was the most thoroughly investigated, as there were inshore survey cruises within the waters of the Archipelago and offshore survey cruises somewhat further out to sea but still in the vicinity of land.

(Continued on page 60)

SHIP	*BEGINNING AND END DATES OF CRUISES*	*AREAS SURVEYED*	*PERIOD OF WORK IN THE TERRITORY*
H. M. SMITH	*23 Sept.-17 Dec. 1955*	*Marquesas*	*24 Nov.-30 Nov.*
H. M. SMITH	*1 Aug.-5 Oct. 1956*	*Marq.+Tuam.+Soc.*	*17 Aug.-22 Sept.*
C. H. GILBERT	*6 Aug.-26 Sept. 1956*	*Marquesas*	*14 Aug.-18 Sept.*
H. M. SMITH	*11 Jan.-26 March 1957*	*Marq.+Tuam.*	*24 Feb.-20 March*
C. H. GILBERT	*11 Jan.-22 March 1957*	*Marq.+Tuam.*	*18 Jan.-14 March*
J. R. MANNING	*4 Jan.-12 March 1957*	*Marquesas*	*15 Jan.-4 March*
C. H. GILBERT	*2 Oct.-14 Dec. 1957*	*Marquesas*	*14 Oct.-30 Nov.*
H. M. SMITH	*3 Jan.-2 May 1958*	*Marquesas*	*18 Jan.-12 Feb.*
C. H. GILBERT	*7 Feb.-2 May 1958*	*Marquesas*	*24 Feb.-19 April*
H. M. SMITH	*28 March-23 June 1958*	*Marquesas*	*14 May-10 June*
C. H. GILBERT	*7 Jan.-26 March 1959*	*Marq.+Tuam.+Soc.*	*20 Jan.-15 March*
CAPE FALCON	*26 Jan.-17 March 1959*	*Marq.+Tuam.+Soc.*	*15 Feb.-17 March*

(This last ship, a San Diego-based tuna-clipper, was on charter.)

Overseas Training For Niueans

Nearly forty young Niueans are being given overseas training by the New Zealand Government during 1959 to enable them to take responsible positions in the management of their island.

In New Zealand, twenty-one students of both sexes are studying at secondary schools and at technical, agricultural and teachers' training colleges. Also there on short training courses are a clerk from the Niue Treasury, the clerk interpreter from the Niue Police Department, and the headmaster of a village school.

In Western Samoa, five Niue students are taking courses at Avele Agricultural College, while five nurses are training at the General Hospital in Apia.

In Fiji, a laboratory assistant and two assistant medical practitioners are attending the Central Medical School in Suva. One of them is taking a post graduate course in anaesthetics.

Native Loans Scheme Popular

In the year ending June 30 last, seventeen loans totalling £18,770 were made by the Native Loans Scheme now operating in Papua and New Guinea. Amounts ranging from £200 to £2,700 were lent to native local government councils, co-operative societies and other community groups to finance the purchase of work boats, outboard motors, fishing gear, tractors and trailers, and agricultural machinery. Loans ranging from £100 to £1,500 were also made to individuals to develop land, to establish a trading store, and to provide more working capital for existing business concerns

One loan of nearly £4,000, made to a co-operative society for a period of five years, has been repaid in eighteen months.

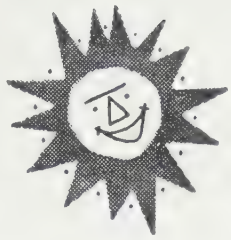
Applications for further loans now under consideration are to enable the purchase of livestock and sawmilling equipment, and the installation of a village water supply.

Machinery Pool For Fiji Farmers

As well as a new rice mill, an agricultural machinery pool is to be set up for farmers in the Rewa Valley, in Fiji. It will be maintained by the Department of Agriculture, which will also provide advice and technical assistance.

The pool will comprise two seed drills at £281 each; a drill at £185; twelve knapsack sprayers at £16 2s. 6d. each; two rotary dusters at £17 each; one sprayer with spares at £85; two land levellers at £100 each; and a supply of spares at £200. According to their value, implements will be hired to farmers at charges varying from 5/- to 15/- a day.

The equipment will help to improve the planting of rice, and will assist in the control of rice pests and diseases. Sprayers for other crops such as bananas will also be available.



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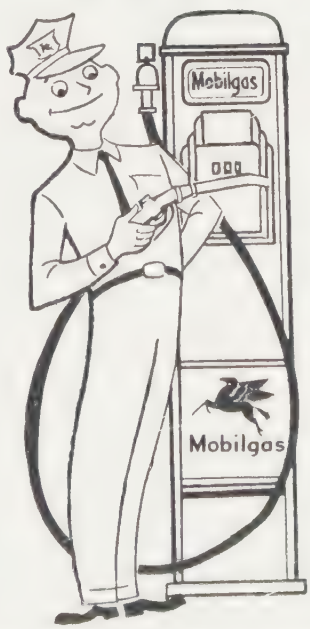

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The author on a field trip through the jungle to observe and collect native herbs and medicines.

Anthropology And Public Health

*In the following article the author, who has been working as an applied anthropologist in the United States Trust Territory of the Pacific Islands since 1950, discusses the unique and valuable contribution that the anthropologist can make in the field of public health.**

By FRANK MAHONY

WORKERS in the field of public health are of necessity trying to change attitudes, beliefs and behaviour; for the adoption of new techniques for preserving health and preventing sickness involves a change in one or all of these factors.

Because the anthropologist is primarily concerned with attitudes, beliefs and behaviour—culture and customs to use another phrase—he has a unique contribution to make to the field of public health. He can make this contribution in one or more of several ways: (1) by promoting an understanding of the way of life, including the concepts of disease and health, of the peoples with which he is familiar, (2) by suggesting approaches to problems of public health that are likely to be effective and more acceptable, (3) by aiding public health personnel to understand their own attitudes and values, and the possible effects that might flow from them, (4) by promoting an understanding of public health aims and programmes among the population at large, and (5) by contributing directly to our knowledge of therapy and of the causes of disease and disease patterns. In this paper I propose to comment briefly on these aspects of the relation of anthropology to public health, drawing especially on my experience in the United States Trust Territory of the Pacific Islands.

UNDERSTANDING CONCEPTS OF DISEASE AND HEALTH. All peoples have developed their own body of knowledge and beliefs concerning the causes of, and treatment for, disease.

In the Trust Territory most people believe that sickness is due to the actions of ghosts or spirits of the dead, to sorcery and witchcraft, or that it is the result of the violation of various taboos.

Treatment of disease is intimately related to what is believed to be its cause rather than to the symptoms manifested. Consequently, cures usually seek to deflect sorcery or make it return to the sorcerer (in which case the sorcerer himself becomes sick), to placate the ghosts or spirits of the dead, or to try to emasculate the power of the taboo.

Also prevalent is the belief that hostility or enmity alone can cause illness. This is especially true as between close relatives. In such cases an ancestral or family ghost is usually thought to be the direct cause of the illness. No amount of medicine of whatever kind will do much good in these cases because, people say, the illness cannot be cured until the angry feelings are completely assuaged.

These are some of the principal beliefs regarding the causes and cure of disease, although there are others. The belief is growing, for instance, under the influence of foreign contact, that sickness may be due to the fact that something is wrong with the body. This belief is possibly the result of the demonstrated effectiveness of surgical techniques, in which the people themselves are almost entirely lacking.

The beliefs briefly sketched above have been very tenacious in the face of fifty years or, in some instances, one hundred years or more of fairly intensive Western contact. It is not surprising, therefore, that Western concepts of illness—which we shall abbreviate by calling them the germ theory of disease—have not been fully accepted by the majority of the people. There are, of course, no words for germs in these languages, so translators are forced to use words which literally mean "worms" or "little animals". These words are likely to evoke images of intestinal parasites or insects.

Some administrators and missionaries like to argue against native theories of illness, basing their arguments on their own "rational" beliefs. Such arguments usually succeed only in breeding secretiveness or hostility. It is not much different nor much more effective than arguing with Westerners about their religion because it is not "rational".

In defence of these beliefs people will usually cite a number of cases of sick persons who apparently were not benefited by hospital treatment but who were later restored to health through the use of native medicine. Comparable instances, where people were benefited by the hospital after the apparent failure of native medicine, are almost never mentioned.

APPROACHES TO PROBLEMS OF PUBLIC HEALTH. In many societies there is a tendency towards the use of certain ritual numbers. Among Europeans the number seven has a certain "magic" about it. There are seven wonders of the world, seven cardinal virtues, seven deadly sins, seven days in the week and so forth.

Numbers of this sort may be used in medicine. In one area of the Trust Territory, for instance, a medicine man may make a concoction of four leaves from one plant and two leaves from another; this medicine may then be administered twice a day for four days. This pattern tends to repeat itself in many different contexts; the numbers two and four constantly recurring.

Doctors would be well advised to suggest to patients of this group that a particular medicine be taken either two or four times a day rather than the three times a day that is so common among Westerners. By using numbers of this sort in these and in other ways, doctors might find that their medicines were more readily accepted. Other techniques of this kind could also be employed.

* The author prepared this article as a background paper for the health education training course held in Guam last November.

Above: A native medicine man squeezing a concoction of herbs into a wash-basin filled with coconut milk. Centre: Next, the medicine is boiled by adding hot rocks. Right: The patient, wrapped in mats or blankets, inhales the steam from the hot liquid, which she then drinks. Their own medicines are still vitally important to most people in the United States Trust Territory.

Hospital administrators, to cite another example, have sometimes tended to be somewhat strict about visiting hours and the practice of bringing food to patients, particularly such foods as pounded breadfruit wrapped in leaves, which may be regarded as insanitary.

We have already mentioned the belief that certain patients may not get well as long as enmity exists between them and their close relatives. Combined with this is the fact that local foods, apart from their subsistence value, may be very important psychologically. The sharing of food is frequently an expression of family solidarity and of feelings of love and comradeship. In such circumstances it would be wise to try to find ways to accommodate the desires of the people to visit their sick relatives and to bring them food. This would help to alleviate some of the anxiety people feel about coming to the hospital.

It could also be suggested that perhaps the most rewarding efforts of public health workers will be in the field of health education. Such efforts should be concentrated on younger people of school age and utilize demonstrations, visual aids and technical equipment such as microscopes. People are more likely to believe, or be affected by, what they can actually see with their own eyes.

Concomitantly less emphasis should be placed on public health campaigns where attempts are made to get people to build privies and to reduce fly, mosquito and rat populations. We do not mean that such campaigns should be eliminated. They do achieve results; privies are constructed. But all too frequently they are built only to satisfy the desires of administrative personnel—and unused, they stand there, mute symbols of the willingness of the people to co-operate. This should not be surprising, for if the people do not believe or understand the germ theory of disease, even less can they be expected to understand the function of disease vectors, and efforts to do something about them are often regarded as so much waste of time, materials and effort.

These are some of the reasons that we suggest that health education should have priority, especially when funds are limited and economy must be practised; that this education should be concentrated among younger people and that the means employed should be visible and demonstrative.

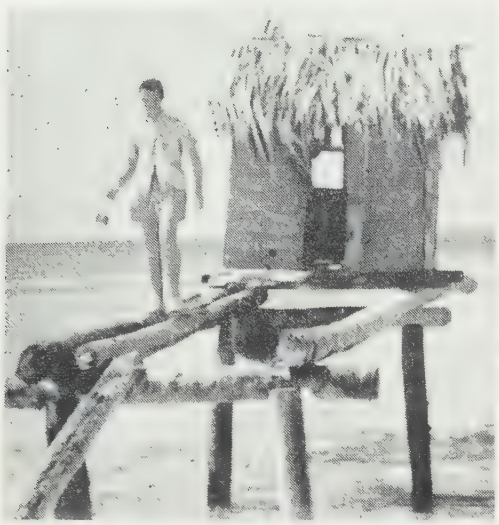
These are a few of the approaches to problems of public health that might be suggested. Careful research might produce many more. It should be noted, however, that in each case the approach should be adapted to the area concerned. These approaches are felt to be particularly applicable to the Trust Territory. Proposals appropriate in one area might not be appropriate in another. For instance, in other countries it has often been suggested that local medicine men and mid-wives be sought out and their co-operation enlisted in public health programmes. This method would not be particularly effective in the Trust Territory, where almost every adult past middle age knows and practises some medicine.

AIDING HEALTH PERSONNEL TO UNDERSTAND THEIR OWN ATTITUDES. In underdeveloped areas, health workers may be recruited from the local population, or they may be foreigners unacquainted with the culture and customs of the local population. Both of these groups present certain problems with respect to their attitudes and values.

In many under-developed countries a vast gap separates the educated upper classes from the masses of the peasantry. The educated group, eager to dissociate themselves from what they regard as an ignorant, superstitious peasantry, tend to disparage and look down on their countrymen. Since health workers are recruited from amongst educated people, there is a danger that local recruits may bring these attitudes into the public health programme, which will suffer accordingly. This is not a problem in the Trust Territory where, for the most part, groups are quite homogeneous in spite of differences in educational levels achieved.

More of a problem among locally-recruited health personnel in the Trust Territory is the fact that a sense of responsibility for others, a tradition of public service for the public good, is relatively undeveloped. Traditionally one was obliged to serve and to help one's extended family, lineage or clan. For these groups, people have a binding feeling of duty and obligation, but these feelings are rarely extended to include non-relatives. In some cases the consequences of this may be a lack of the proper amount of tender, loving care so necessary to the well-being and eventual recovery of hospital patients.

It should be mentioned that these attitudes may also be reversed. That is, the people may not have full trust and confidence in their own medical workers



Above: To demonstrate their co-operative zeal the people eagerly build privies. However, frequently placed out in full view of an entire village, they are seldom used; often serve only the needs of visiting administrative personnel. Right: Almost all cooking is done over low fireplaces. The contention of some that low fireplaces are n ecessarily insanitary is strongly questioned.

and sanitarians. They hesitate to expose their bodies before their own medical workers for fear of being talked about by them. They also lack confidence in their own sanitarians because they feel that, like themselves, they do not really possess the skills and knowledge that are the special perquisites of the foreigners. Consequently they frequently desire the services of foreign medical workers and sanitarians more than their own. If health workers have an understanding of these and similar attitudes they are likely to do better jobs.

Health personnel who are foreign to the area in which they are working must be careful not to introduce their own ideas and customs in the guise that they are essential to good health and proper hygiene.

Some field workers of my acquaintance have tried to get villagers to build raised hearths in place of ordinary fireplaces built on the earth. They felt that since pigs, dogs, chickens and what-not were always milling around the fireplace where food was being prepared, there was danger of contamination. However, providing that this problem really existed, the building of raised hearths does not seem to be the only answer.

Other field workers have tried to get villagers to abandon the practice of preserving breadfruit in shallow pits in the ground because they claimed that it smelled bad and was insanitary. Still others have tried to stop the habit of betel nut chewing on the grounds that the constant spitting which accompanies it helps spread tuberculosis and other infectious diseases.

These efforts were all conspicuously unsuccessful and bound to be so. People do not readily abandon things to which they have been accustomed for years, as witness the increasing consumption of tobacco among Westerners in spite of the clear evidence that its use is closely associated with cancer and other diseases. Or consider the difficulty that would be encountered in any attempt to stamp out the practice of kissing among Westerners, a practice which, as many Trust Territory people have pointed out, is quite insanitary.

In any event, what we are trying to point out here is that these things—low fireplaces, preserved breadfruit, betel nut chewing—do not seem particularly harmful or dangerous in and of themselves. Hedged about with the proper precautions, they could be continued quite safely. There is a strong possibility that in attempting to have people abandon these and similar customs, field workers have been influenced more by the forms of their own culture than by fundamental considerations of hygiene. A greater understanding of their own attitudes on the part of public health personnel might help to prevent the animosity that is sometimes engendered by insisting on changes that may not really be necessary for health reasons alone.

Promoting Understanding Of Public Health Programmes. Anthropologists who are employed by an administration are often in a position where they can help to explain public health programmes to the people. Frequently they are able to speak the local language, are familiar with the culture and are in constant contact with the people, who frequently look to the anthropologist for a better understanding of what "you foreigners" are doing now.

Most anthropologists would avoid committing themselves to the support of particular programmes—in the sense that they would insist that people do what was desired—so that their position as an intermediary between two cultures would be preserved. Failure to maintain a neutral position might shut off the flow of information. However, they can explain the *rationale* behind programmes and thus increase understanding and in some cases alleviate anxiety.

Medical surveys of different kinds are a frequent source of misunderstanding. Where blood samples are being taken, people may become suspicious that their blood may be used for some evil purpose. Where X-rays are taken, people may feel some anxiety about being partially disrobed. Medical survey teams which do not contemplate doing any therapy can easily cause such suspicions because people may have no idea why they are there or what they are doing. In such situations careful explanations may help though I would recommend that medical personnel be always ready to extend therapeutic assistance.

Contributions To Knowledge Of Therapy, Disease And Disease Patterns. This is an aspect of anthropology's potential contribution to the health sciences that has received little attention in the past, but is bound to be of increasing importance in the future. From the viewpoint of therapy, anthropologists, in their studies of the medical lore of under-developed areas, are bringing to the attention of the scientific world those medicines that seem to have efficacious effects.

So far as we know, anthropologists have not yet made any outstanding discoveries. But news magazines have recently carried stories about a Seminole Indian who apparently has an herbal formula for a tranquillizer which seems to work better and have fewer side-effects than any now in use. The laboratory of

an ethical drug company now has this under study. It is possible that more discoveries of this nature may yet come from the Trust Territory and similar areas.

An example of possible contributions to knowledge of disease comes from research I have been doing on Ponape in collaboration with other anthropologists. (Cf. "Totemism and Allergy" by Ann Fischer, Jack Fischer and Frank Mahony; this paper will be published in a forthcoming issue of *The International Journal of Social Psychiatry*.)

We have discovered that asthma (Ponapean, *lokilok*) is very prevalent among Ponapeans. Ponapeans recognize this. They say that they have been afflicted with this malady since aboriginal times, and they list it as one of their most important illnesses. Statistics bear this out. In 1956, for example, of 241 cases discharged from Trust Territory hospitals with the diagnosis of asthma, 104 were Ponapean cases. Thus Ponape, with only 20% of the population of the Trust Territory, had more than 43% of the cases of asthma.

We believe that the high incidence of asthma in Ponape is directly related to the practice of totemism. On Ponape certain animals and fish are believed to be the ancestral mothers of the various clans. These are the clan totems. Ordinarily these totem animals are taboo and should not be eaten. For various reasons, either by accident or design, a person occasionally eats his totem animal.

On these occasions certain culturally-prescribed illnesses are supposed to afflict the taboo violator. Many of these illnesses bear striking resemblance to allergic disorders. The eating of these taboo fish, in other words, may cause an allergic reaction. Since asthma, for the most part, is an allergic disease, we suspect that its high incidence is directly related to the allergic sensitivities Ponapeans have for totemic animals.

Ponapeans, in effect, are "psychologically prepared" to suffer allergic reactions. We believe that this explains the high incidence of asthma among Ponapeans. Furthermore, through additional studies of this kind, we might come to a better understanding of the nature of allergy itself.

We have discussed above some of the ways in which anthropology can be of assistance to public health. At this point we would like to enter a caveat. Anthropology or the other social sciences cannot always offer solutions to problems brought to their attention. A health worker may say to an anthropologist, "Look here, I just can't get the people to do such and such; they simply won't co-operate at all. What do you suggest?" Ordinarily the anthropologist should be able to help determine *why* the desired

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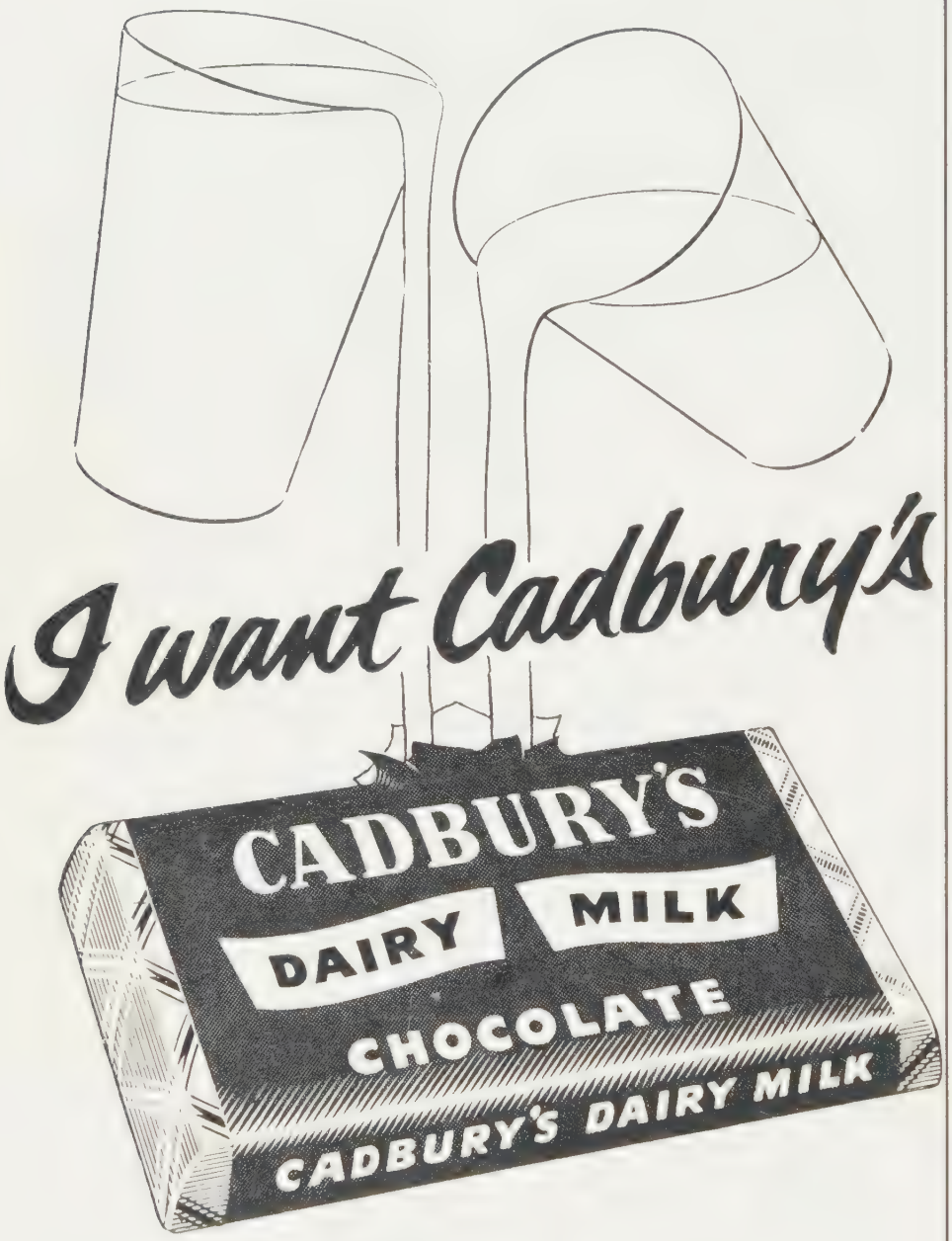

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co-operation is not being achieved, but he will frequently be unable to provide a certain solution which will quickly bring about the desired results. After all, when you are dealing with human beings, many situations come about to which there is no ready answer—situations which have the characteristics of irresistible forces in opposition to immovable objects.

In cases like these the best that can be hoped for is a flexible adjustment to the facts as they are known. Furthermore, anthropologists are themselves human beings, and they, too, make mistakes. To put it briefly, the social sciences do not always offer the infallible answer.

Moreover, a great deal can be accomplished without active intervention of any kind. If a complete line of health services is made available and a kind, sympathetic, understanding staff is provided to run them, the people will make adjustments to this situation on their own.

In one area of the Trust Territory, for instance, people divide illness into two categories: that which was present from aboriginal times and that which was introduced by outsiders. This is a logical distinction, since tuberculosis, influenza, venereal disease, smallpox and other maladies have been present in the Trust Territory only since foreign contact. The people of this area say that for foreign diseases, foreign medicine is best, while for *their own* diseases *their own* medicine is best. Consequently, those diseases that are recognized as foreign are most likely to be referred to the hospital.

In another area the causes of disease are most often sought through divination. Divination takes the form of a "yes" or "no" answer to a question. Thus the diviner will ask if the disease is due to ghosts, and the answer will be "yes" or "no". If "no", he may go on to ask if it is due to sorcery, and so on. If the diviner continues to receive negative answers he may shrug his shoulders and refer his patient to the hospital.

Some diviners have gone a step farther. They start out by asking if the patient can be cured with native medicine. If the answer is negative they immediately refer the patient to the hospital. The laws of probability alone ensure that fifty per cent of this diviner's patients will be referred to the hospital.

Another factor working in favour of public health authorities is the high cost of native medicine. One seldom pays a local medicine man less than five dollars, and payments in goods, food and money totalling fifty dollars or more are not uncommon. In contrast, payment for hospital services is low. A visit to the hospital may cost as little as ten to twenty-five cents, medication included. And if a patient doesn't have the money he is not forced to pay. These low rates help to encourage the use of foreign medication in place of local remedies.

In recent years people in the Trust Territory have shown a strong tendency to "hedge their bets". They like to use public health facilities in conjunction with their own remedies. The person who comes to hospital sick call may already have consulted a native medicine man and be under treatment by him. Those confined to the hospital may have native remedies covertly smuggled in to them so that "the two kinds of medicine can help together".

In these and other ways people are gradually adapting to the presence in their midst of modern public health institutions. While they haven't suddenly been converted to a belief that public health institutions are much better than their own, they *are* taking them into account in their thinking, and it is causing almost unconscious changes to take place.

Where a diviner formerly referred all of his patients to native medicine men he now refers about half of them to the hospital. This is progress. Though it may seem like a perverse kind of progress to some, it is the kind that can take place without upsetting or destroying native institutions.

Consequences Of Change Should Be Carefully Considered

It is important to keep in mind that change will probably have to be gradual. Also, we should always be conscious of the consequences that may flow from the introduction of change. Because the culture and social organization of an underdeveloped community is often a closely-knit system, the introduction of change at one point of the system may have undesirable effects at another. In addition, attempts may be made to alter certain customs because at first glance they seem undesirable. On the contrary, greater familiarity with these customs might show them to be more valuable than at first suspected. We should never overlook the possibility, for instance, that some native remedies may be as good as, or better than, our own.

Anthropologists have built up a large body of knowledge about the culture and social organization of under-developed areas and about change and the effects of change; and they are trying to expand and improve this knowledge. Public health authorities should be able to find many uses for this information.

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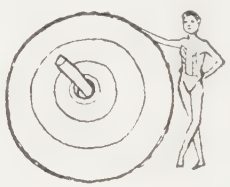

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Pacific Tuna Fishing Investigations

(Continued from page 52)

The results have proved that the number of schools of tuna varies considerably according to the season, a fact which had already been established when the marine environment was studied.

The figures below summarize the data obtained on the various cruises:

1: INSHORE SURVEYS

Dates	Number of schools	Average per day
14-21 October 1957	*34*	*4.2*
24-30 November 1957	*41*	*5.8*
18-25 January 1958	*75*	*8.3*
24 Feb.-5 Mar. 1958	*99*	*12.1*
11-19 April 1958	*50*	*5.5*
1-10 June 1958	*61*	*6.1*

2: OFFSHORE SURVEYS

Dates	Number of schools	Average per day
24 Oct.-6 Nov. 1957	*25*	*1.8*
28 Jan.-11 Feb. 1958	*75*	*5.0*
26 Mar.-8 April 1958	*60*	*4.2*
15-29 May 1958	*53*	*3.5*

It will be noticed that surface tuna are more plentiful from January to March, and that their numbers then decrease.

Identification of fish within the schools gave the following results (the percentages are given for the groups of fish which were identified and no account was taken of those too far away or unrecognizable for any other reason):

80% were skipjack schools;
15% were yellowfin schools;
5% were mixed skipjack and yellowfin schools.

Nearly all the small yellowfins were caught from mixed schools. The skipjacks caught within the Archipelago waters weighed at most 9 lbs., with an average of about 5 lbs. On the other hand, 32% of those caught during the offshore survey cruises weighed approximately 18 lbs.

Generally speaking, the schools of tuna travelled extremely fast and were difficult to approach, which conditions do not make for easy fishing.

Contrary to the results of the surveys around the Marquesas, a few observations made north-west of the Tuamotu Archipelago were more encouraging. Although few schools were seen the fish were not so shy, took the bait more readily, and there was a greater proportion of large skipjacks taken.

As P.O.F.I. ships were engaged in research work, some of the tuna caught were tagged and released; a total of 4,584 skipjacks and 196 yellowfins. None of them was captured again in other waters, which seems to indicate that the tuna population established around the Marquesas and the Tuamotus is more or less sedentary.

During these cruises the Marquesan sardine (*Harengula vittata*, C. & V.) was used as live bait. It is very satisfactory for this purpose as its behaviour both in the sea and in the ship's bait tanks is good, provided a few precautions in handling—now standard procedure on tuna clippers—are taken. Unfortunately P.O.F.I. observers were forced to admit that the Marquesan sardine population around the islands is either too small or too widely-fluctuating to be of any use as a supply of live bait for a big commercial ship.

Experimental fishing for deep-swimming tuna was carried out with a longline similar to the Japanese commercial one, but adapted by P.O.F.I. technical staff so that it did not require so many hands. The ships cruised at three different times. Results are shown below:

PERIOD: 16 August to 4 September 1956 (on board CHARLES H. GILBERT).

GEAR: 60 baskets with 11 hooks each.

BAIT: The Pacific herring (*Clupea pallasi*, Val.).

STATIONS: 20 in all, 11 along the 132nd W. meridian, from 1°N. to 12°S.; 5 from 12°S. to 7°30'S. to the 138th W. meridian; 4 in the waters of the Marquesas Group.

RESULTS: Very poor catches. Yellowfins were more plentiful near the Equator and in the Marquesas waters. The albacores were in a minority and seen mostly near the shores. A few big-eyes and large skipjacks were caught. The yield was never more than 3 fishes per 100 hooks, and mostly around 1%.

PERIOD: 16 January to 5 March 1957 (on board JOHN R. MANNING).

GEAR: 60 baskets with 11 hooks each.

BAIT: The Pacific herring (*Clupea pallasi*, Val.).

STATIONS: 38 in all, 13 along the 132nd W. meridian from 4°30'N. to 14°S.; 10 in the Marquesan waters; 15 along the 148th W. meridian, from Tahiti to 3 N.

RESULTS: Poor from the two stations along the 132nd and 148th meridians, where the yield was approximately 1%. On the other hand, the average yield in the Marquesan waters was 3.4% and sometimes up to 8.5%, which is considered to be good fishing. Most of the catches were yellowfins but there were also big-eyes, skipjacks, albacores and swordfish. Sharks were ever present in large numbers and did considerable damage.

PERIOD: 15 to 21 February (on board CHARLES H. GILBERT).

GEAR: 44 baskets with 11 hooks each.

BAIT: The Pacific herring (*Clupea pallasi*, Val.).

STATIONS: 7, along the 150th meridian between 5°N. and 1°S.

RESULTS: Very poor. The yield remained in the vicinity of 1%, with only a few more yellowfins than big-eyes, skipjacks and swordfish. There were many sharks.

In conclusion, it is possible to say that longline fishing around the Marquesas Group is not a sound proposition except within the Archipelago itself, and there the sharks do great damage to the gear and to the fish caught. It appears also that some notice must be taken of a seasonal variation: as is the case for fishing with live bait, the austral summer is more favourable for longlining. But in any case, the trials with longlines have so far been too few and too haphazard to permit of final conclusions.

After having studied the results already obtained, P.O.F.I. decided to carry out a commercial live-bait fishing trial around the Marquesas, and chartered a tuna clipper from San Diego, the CAPE FALCON. At the same time, the CHARLES H. GILBERT continued the P.O.F.I. trials on the same basis as before.

Observers on board the CHARLES H. GILBERT noticed that the schools of tuna near the Marquesas were not so plentiful as they were at the same period in the previous years. They spotted only 38 schools instead of nearly one hundred. These schools included mostly 5 lb. skipjacks. West of the Archipelago, they spotted 20 schools in 8 days, mostly 10 lb. skipjacks.

The CAPE FALCON filled its bait tanks off the Mexican coast, in Almejas Bay ("anchovettas", *Cetengraulis mysticetus* (Günth) about 6 inches long). With this bait she caught 15 tons of tuna in 30 days. The crew saw 183 schools, mostly skipjacks, and caught 81 skipjacks which weighed 16 lbs. each on an average, and 1,108 yellowfins whose weight varied between 8 and 50 lbs. The best fishing grounds were found north of the Archipelago.

All-in-all the experiment, as commercial fishing, was a failure. It must be noted, however, that fewer surface schools were encountered than had been expected, and also that the bait used by the CAPE FALCON was larger than usual, even by Californian tuna-clipper standards.

Conclusions

The above outline of scientific research work, coupled with experimental fishing carried out around the French territories of the South Pacific, show that the problem is very different according to the territory concerned.

Around New Caledonia and Dependencies and around the Condominium of the New Hebrides, tuna fishing can be carried out on a small scale with trolling gear, and on a commercial basis with longlines. Around the islands of French

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Polynesia (the Marquesas and the Tuamotus were the only Archipelagos really investigated), tuna fishing with live bait is sound commercially. Results are not quite so conclusive with the long-line. Trolling on a small scale would probably supply the local market.

The data so far collected emphasizes the very great importance of the scientific research work carried out from the territories. Such results as are already available have indicated which are the best methods to be used according to the type of fishing intended, whether small-scale or commercial.

They also provide information concerning the species of fish and the yields, which will be useful for any eventual commercial use of pelagic fish. Finally, they have shown that non-specialized, locally-recruited crews can adapt themselves to new fishing techniques (the officers of the ORSOM III are European, and the five or six hands Melanesian or Polynesian).

All the elements which were listed in the introduction as being vital for the revival of fishing in the Pacific are, therefore, present, and the necessary effort should be made to foster it to the utmost.

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Fisheries Development In Papua And New Guinea

(Continued from page 26)

smoked fish are traded up to 50 miles from fishing grounds. The Division has assisted in developing an improved type of smoked fish product. Plans are available of a smokehouse designed in the territory before the War, as well as circulars describing the method of preparing fish for smoking. Assistance by technical officers is given to village people developing further trade.

Turtle And Dugong Fishing

In some villages turtles are fished for seasonal feasts and then left for several months until sufficient are again available for another feast. In other places, small turtles are hatched from eggs and the young kept in confinement until they reach edible size. Sometimes, too, in the Admiralty Islands, turtles are kept in pens in shallow water and regularly fed seaweeds, cut-up clam meat and coconut kernels, and may be considered domesticated animals.

Although turtle fishing is well regulated, it is probable that dugong, which have a very much smaller breeding rate and are eagerly sought, will become rare unless protection measures are taken soon.

Beche-De-Mer

The work involved in catching, cooking, cleaning and smoking requires organizing ability usually far above that of the village people. However, production has recently increased, and small quantities are sold to dealers at an average price of about 4/- a pound.

Experiments using dredges and traps in deep water where the best beche-de-mer are found have been only partially successful, and traditional skin diving methods, with the addition of goggles, produce most of the beche-de-mer marketed.

Prices for best quality deepwater black, white mama and mamateat have at times exceeded 10/- a pound, but the market is limited and only a high-quality product is sold.

Shell Fisheries

The export of shell from the territory is only a part of the trade in shell in Papua and New Guinea, and a part of the wealth of the territory peoples is in shells used in trade or barter. In times of war these shells have formed a sound, stable currency.

Cone shells and small gastropods, money cowries, pearl shell, green snail and clams are the principal shells used for barter.

The export of shell of all types reached a value of about £450,000 in 1956, but value has since declined to slightly more than half this value. During the period of high prices, fishing effort increased considerably, and production of trochus, the most important shell, reached 840 tons in 1955. However, decline in quantity had already started in 1956, and in 1957 only 530 tons of trochus were produced. Some of the shipments in the last years of high prices were reported to be more than 30% inferior grade.

The limited over-fishing during the period of good prices was not harmful to the beds. In most villages, fishing is restricted by periodic closure of reefs.

Investigations of the size of shell marketed have shown that increase in the legal size of trochus by ½ in. to 3 in. (minimum width across the base) would decrease the present production by 8%, but would make a more stable reserve stock. The principal factor to be considered against any increase in size is the number of small shellfish used as food in times of scarcity of other seafoods.

Greater shell trade may come from the marketing of a wider variety of shells for costume jewellery and brooches, and for shell collections. This type of trade developed during and immediately after the last war. However, no production figures in export quantities are available.

Most important shells in this category may be helmet shells, olives, cones, strombus, cowries, etc. A co-operative effort in producing shell for collectors in overseas trade may develop into a profitable industry.

Fish Production

An investigation in 1949 suggested that about 3,500 tons of fish were caught annually in Papua and New Guinea. Recent surveys suggest that the production is much higher, probably exceeding 10,000 tons per annum. This quantity is eaten mainly by coastal and river people. In upland areas the consumption is almost nil.

The high cost of ship maintenance in the territory combined with the relatively low rate of fish production makes sea fishing costs almost prohibitive. However, introduction of new fishing techniques promises the most rapid development of sea fishing.

The need for fish is greatest in the Highlands, and extensive areas of swamp land have a great potential for pond development, at a lower cost of production per pound than for sea fish.

Villagers Building Brick School In New Ireland

A cement-brick school building has been erected at Madina, on the east coast of New Ireland, through co-operative effort by the village communities, senior students, technical students, and the Administration.

The new structure is 50 ft. x 18 ft., and is the first of three to be constructed at the Nalik Administration Primary School in the Madina area. These will replace temporary buildings of bush materials.

At the request of village communities whose children attend Nalik School, a small brick-making machine was sent to Madina, and the villagers and older students made bricks for the new building in their spare time, using crushed coral rock. In constructing the school they were assisted by a technical instructor from the teaching staff of the Malaguna Administration Technical School, working with a team of Malaguna senior technical students receiving on-the-job training on construction projects in New Ireland.

The Administration met all out-of-pocket construction costs, which totalled £409 including the outlay for cement and a galvanised iron roof. The three buildings will cost approximately £1,250.

PACIFIC READING

Material in this section is contributed by the South Pacific Commission Literature Bureau. Any enquiries relating thereto should be directed to BOX 5254, G.P.O., SYDNEY, AUSTRALIA.

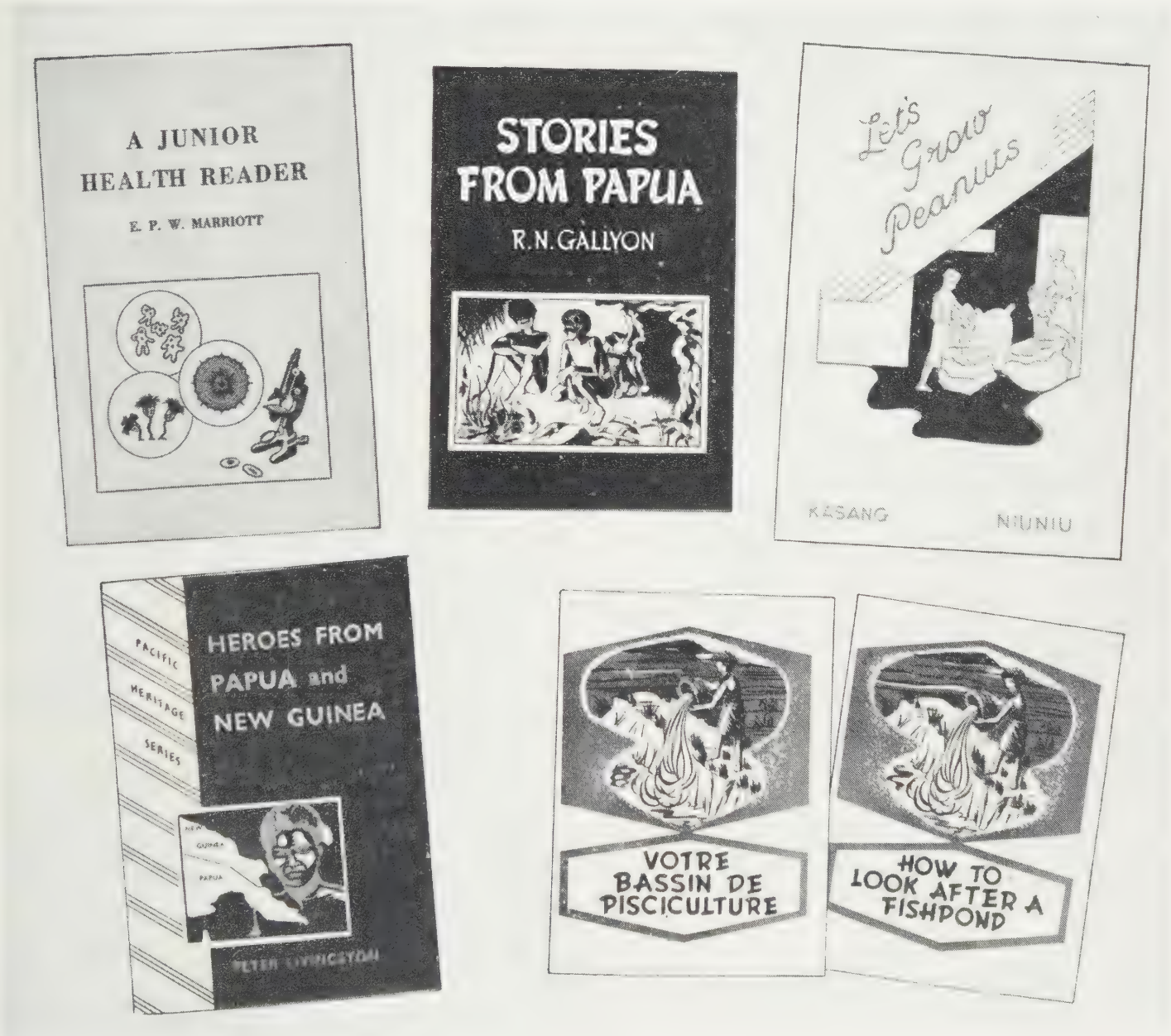
Notes and News

Literature Bureau Publications. The accompanying illustration shows the covers of some recent publications of the Literature Bureau produced in co-operation with various publishers or on behalf of territories.

The publications *Stories from Papua, Let's Grow Peanuts* and *How to Look After a Fishpond* were referred to in "Notes and News" in the July, 1959, issue of this periodical.

Heroes from Papua and New Guinea is the title of a new book published by Macmillan & Co. in association with the Literature Bureau. Attractively produced with a two-colour cover, this book is a companion volume to the already well-known *Heroes from Fiji*, in the PACIFIC HERITAGE series of supplementary readers. Written by Peter Livingston of the Department of Education, Papua and New Guinea, this 48-page book contains eight short stories recording acts of courage and loyalty performed by Papuans and Europeans in the territory.

Written in simple English and attractively illustrated with eight full-page line drawings, this book should prove useful as a supplementary reader at about 4th-6th year level of English; the subject matter is equally suitable for school or adult reading.



Covers of a selection of new books produced recently by the SPC Literature Bureau in co-operation with various publishers or on behalf of territories.

STORIES FROM PAPUA

R. N. Gallyon

This reader for juniors who have had three or four years' schooling is a collection of traditional Papuan stories about the origins of island customs and the characteristics of birds and animals. The simple language suits the stories and they are illustrated with bold attractive drawings at every opening. All Papuan children should get to know the stories which are part of their island background, but the book's appeal will not be limited to Papua. *1s 6d*

THE STORY OF BRITISH DEMOCRACY

P. G. Lloyd

This is a background book, particularly for students with a knowledge of English, visiting Britain for the first time or preparing to do so. It traces the development of the British system of government from its first beginnings to its present complex and highly organised state; there are useful chapters on education, industry and agriculture, on the arts and on British life and customs. It is illustrated with photographs and diagrams. *5s*

READERS 1 & 2

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Two books in a series of twenty Pupils' Readers being prepared in connection with the popular series of forty large full-colour Class Pictures of the same title. These two books deal with a wide variety of types of domestic animals and their uses to man. 1. *Farmyard Animals,* 2. *Cattle and Sheep. Many coloured illustrations.* *2s 6d each*

BOOKS 3, 4 & 5

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E. R. Boyce

Three recent books in a series for children of about 8 to 11 providing supplementary reading material for Religious Education: it gives a simple and vivid account of life in Palestine today, showing how much has remained unchanged since the time of Christ. Books 3. *Clothes and Food,* 4. *Mothers and Fathers,* 5. *The Animals. Illustrated.* *1s 9d each*

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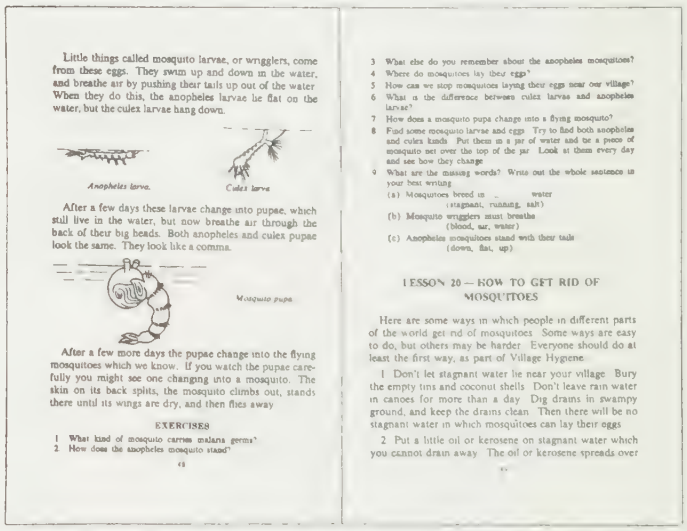
We believe that many more readers of this kind about peoples and events in the Pacific will be of value and interest to schools and adult readers in the Pacific area, and would welcome suggestions and manuscripts.

A Junior Health Reader. This 80-page book has been specially prepared for use in the Pacific area and should fill a long-felt need by island teachers and health workers for a simply-written elementary hygiene book suited to their own environment. It has been written by E. P. W. Marriott (the author of *Papua and New Guinea in Pictures*) and is a revised and expanded version of a small reader previously prepared by the author and used very successfully in mission schools in Papua and New Guinea.

The 32 chapters cover most of the common pests and diseases usually associated with an unhygienic island village. Within a vocabulary of some 700 words, plus a further 50 medical terms, the author details the essentials of village and personal hygiene and describes such pests as flies, mosquitoes, bed-bugs and fleas; such infections as boils, scabies, sores and ulcers; such diseases as dysentery, malaria and yaws; in each instance practical preventive measures are explained. The medical validity of the text is vouched for in the preface by Dr. G. T. Gunther, now Assistant Administrator, but formerly Director of Public Health for Papua and New Guinea.

The text is illustrated with clear line drawings, and a set of review questions and exercises is included at the end of each lesson. Two typical pages are shown below.



Little things called mosquito larvae, or wrigglers, come from these eggs. They swim up and down in the water, and breathe air by pushing their tails up out of the water. When they do this, the anopheles larvae lie flat on the water, but the culex larvae hang down.

Anopheles larva. *Culex larva*

After a few days these larvae change into pupae, which still live in the water, but now breathe air through the back of their big heads. Both anopheles and culex pupae look the same. They look like a comma.

Mosquito pupa.

After a few more days the pupae change into the flying mosquitoes which we know. If you watch the pupae carefully you might see one changing into a mosquito. The skin on its back splits, the mosquito climbs out, stands there until its wings are dry, and then flies away

EXERCISES

1 What kind of mosquito carries malaria germs?
2 How does the anopheles mosquito stand?

3 What else do you remember about the anopheles mosquitoes?
4 Where do mosquitoes lay their eggs?
5 How can we stop mosquitoes laying their eggs near our village?
6 What is the difference between culex larvae and anopheles larvae?
7 How does a mosquito pupa change into a flying mosquito?
8 Find some mosquito larvae and eggs. Try to find both anopheles and culex kinds. Put them in a jar of water and tie a piece of mosquito net over the top of the jar. Look at them every day and see how they change.
9 What are the missing words? Write out the whole sentence in your best writing.
(a) Mosquitoes breed in ... water (stagnant, running, salt)
(b) Mosquito wrigglers must breathe (blood, air, water)
(c) Anopheles mosquitoes stand with their tails (down, flat, up)

LESSON 20 — HOW TO GET RID OF MOSQUITOES

Here are some ways in which people in different parts of the world get rid of mosquitoes. Some ways are easy to do, but others may be harder. Everyone should do at least the first way, as part of Village Hygiene.

1. Don't let stagnant water lie near your village. Bury the empty tins and coconut shells. Don't leave rain water in canoes for more than a day. Dig drains in swampy ground, and keep the drains clean. Then there will be no stagnant water in which mosquitoes can lay their eggs.

2. Put a little oil or kerosene on stagnant water which you cannot drain away. The oil or kerosene spreads over

Typical pages of A Junior Health Reader, by E. P. W. Marriott.

Although primarily intended for use in Melanesian areas, we feel that this book should find wide use wherever health education is being practised. It is particularly suitable for school use at about the Standard V level of English.

Copies of this book are available from the South Pacific Commission Literature Bureau, Box 5254, G.P.O., Sydney, N.S.W., Australia, at A.3/- per copy, plus postage.

Filariasis Leaflet for Cook Islands. A Maori/Rarotongan version of the illustrated health leaflet *Elephantiasis Can Be Prevented* has been produced through the Literature Bureau for the Cook Islands Administration. This leaflet describes the causes and methods of prevention of filariasis and is designed for use at village level; it is similar in

appearance to previous vernacular versions produced for Samoa, and the Gilbert and Ellice Islands, but with the text and illustrations amended by the Commission's health section to make the leaflet suitable for use in the Cook Islands area.

Single specimen copies of this leaflet are obtainable on request from the Literature Bureau, Box 5254, G.P.O., Sydney, N.S.W. We would welcome any enquiries from territories concerning the production of similar type leaflets.

Cook's Pacific Voyages. A small but attractively-produced book describing Captain Cook's voyages to the Pacific area has just been issued by the Islands Education Division of the Department of Education, New Zealand. This is entitled *West of 170 Degrees* (Cook Leaves His Name in the Islands) and the author is R. R. V. Blanc.

In many ways this is a real Pacific Islands book. It re-tells in simple English the facts and events of Captain Cook's visits to various islands in the Cook Group during his second and third voyages: the story includes visits to Manu'a, Palmerston, Niue, Mangaia, Atiu and Takutea.

The book reveals to Islanders an accurate picture of their forefathers, how they lived, and how they reacted to their first European visitors. Things which present-day Islanders take for granted were nothing short of a miracle to their ancestors. The massive ship with no outrigger, its tall masts, the crew with white skins, steel tools and firearms, were things of another world; dogs and pigs were not new or unknown to the Cook Islanders, but the sheep and goats caused some amazement.

Fortunately, Cook was accompanied at this period by Mai, a Tahitian interpreter who had visited England with Cook and was on his way home. Mai was able to converse with the Cook Islanders, and to explain much to them. He was also able to convey the Islanders' wishes and thoughts to Cook and his men. During the third voyage James Cook also carried two New Zealand Maoris who were able to converse with the Atiuans.

The book deserves wide popularity because it is a faithful account of a first meeting of Polynesians with a gentleman of the British Navy who left a favourable impression among peoples of different races and nations. Because of the local colour and interest, it is possible that readers at the Senior Primary stage will read the book with relish; it will also provide facts and historical perspective for Island teachers whose knowledge of the history of contact is often all too limited.

Wealth from the Coconut. All orders for this publication should in future be addressed to the Commission's Literature Bureau in Sydney and *not* to Messrs. Ure Smith as hitherto. The price remains at stg.2s.6d., plus postage, with a discount of 25% for orders for a dozen or more copies. Versions have been produced in the following languages: English, French, Pidgin, Samoan, Tongan, Fijian, Malayan, Maori, Gilbertese, Trukese, Yapese, Palauan.

New Hebrides Primer. A small primer in the Aneityumese dialect is now in the course of preparation by this Bureau on behalf of the New Hebrides Administration. This book will contain 32 pages measuring 6″ x 8½″, and in order to avoid heavy typesetting costs the text is being hand lettered and illustrated with simple line drawings by the Bureau's artist.

Specimen pages of this book with details of production costs are obtainable from the Literature Bureau, Box 5254, G.P.O., Sydney, N.S.W., Australia.

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New Demonstration Farm In Cook Islands

To show Aitutaki villagers improved ways of raising crops, a five-acre demonstration farm was established there last December by the Cook Islands Department of Agriculture.

Several hundred shoots of dry-land taro from Samoa are doing well, and both pumpkins and water-melons have already yielded prolific crops. A large area has been planted in peanuts, and special seedling coconuts are being raised to help improve Aitutaki's poorer plantations.

Another section of the demonstration farm is devoted to several species of pea, maize, carrots, lettuce, beans, sunflower, granadilla (pomegranate), Indian spinach and tomatoes.

Araura School has started an associated coconut nursery, and the co-operative societies in each village are being encouraged to do likewise. Senior pupils of the school spend some hours weekly at the farm as part of their practical agriculture syllabus, and have a tomato plot to themselves.

The first manager, an Atiu Island foreman partly trained in New Zealand and lent to Aitutaki for six months, is helped by four Aitutakians, one of whom will become foreman.

Though village interest was at first small, the way the crops are growing has now aroused much enthusiasm, and already methods are being copied in some family plots.

Record Village Copra Production

In Papua and New Guinea, village copra production for the year ending June 30 last reached an all-time record. Production by village growers totalled 24,558 tons compared with about 22,000 tons for the previous year.

The proportion of villager to plantation-produced copra has also increased, and village output now comprises between 25 and 30 per cent of the territory's entire production. About 60 per cent of the village-produced copra is in the higher grades.

The steady rise in village copra production is attributed to post-war programmes encouraging expansion of village coconut plantings and copra making.

Booklet For Peanut Growers

Let's Grow Peanuts is the title of a 16-page booklet produced recently in three editions—English, Motu and pidgin—by the Commission's Literature Bureau for the Department of Agriculture, Stock and Fisheries in Papua and New Guinea. The texts and illustrations were prepared by the Department, while the Bureau arranged production.

Main purpose of the booklet is to encourage the local people to grow more peanuts, both for food and extra income. It describes simply the correct method of planting, harvesting and marketing a peanut crop, and includes suggestions on the cooking of peanuts for food.

Specimen copies of this booklet, with details of production costs, are available on request from the Literature Bureau, Box 5254 G.P.O., Sydney, Australia.

Multi-Racial Women's Meeting

Early in September, women representing the major races in Fiji held a four-day meeting at Adi Cakobau School, near Suva. There were forty-one delegates, and they came from twenty-three women's organisations in the Colony. Their task was to find out what the women of Fiji wanted to learn, and the best ways of teaching them.

It was the first combined effort on the part of women of all races in Fiji to discover not only how adult education for women can best be put into practice, but also how women can assume more responsibility in the community.

The gathering was organised by the Fiji Branch of the Pan-Pacific and South-East Asia Women's Association.

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South Pacific Commission Technical Papers

Copies of Technical Papers, which are published both in English and French editions, may be procured from the South Pacific Commission, Nouméa, New Caledonia, or G.P.O. Box 5254, Sydney, Australia. Except where otherwise stated, price per copy, post free by surface mail, is 2/- stg. (2/6 Aust., 2/3 Fijian, 30 cents U.S., 1 New Guinea guilder)*.

NUTRITION

18. **Report on Nutrition Investigations by the South Pacific Commission in 1950.** November 1951.
23. **Nutrition Research Conducted in New Hebrides during 1951.** Sheila Malcolm, nutritionist, South Pacific Commission. April 1952.
50. **Nutrition Investigation in New Caledonia.** Sheila Malcolm. October 1953.
63. **Diet and Nutrition in American Samoa.** Sheila Malcolm. August 1954.
83. **Diet and Nutrition in the Trust Territory of the Pacific Islands.** Sheila Malcolm. July 1955.
85. **Etudes sur la Nutrition et l'Alimentation dans les Etablissements Francais de l'Oceanie** (Summary and Conclusion in English). Sheila Malcolm. April 1955.
95. **Bibliography of the Nutritional Aspects of the Coconut** (revised edition of T.P. 58). F. E. Peters. September 1956.
100. **Chemical Composition of South Pacific Foods**—An Annotated Bibliography. F. E. Peters. January 1957. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
106. **Some Food Problems In The Pacific Islands.** H. S. McKee. May 1957.
113. **The Diet of Mothers and Children on the Island of Guam.** Sheila Malcolm. January 1958.
115. **The Chemical Composition of South Pacific Foods.** F. E. Peters. January 1958.
118. **Nutrition and the Papuan Child.** H. A. P. C. Oomen and S. H. Malcolm. April 1958. (8/- stg., 10/-A., 9/-F., $1.20, 4G.)

PUBLIC HEALTH

12. **Tuberculosis Investigations by the South Pacific Commission in 1950.** May 1951.
24. **A Survey of Leprosy on the Island of Nauru.** Dr. C. J. Austin, Director, Makogai Leprosy Hospital, Fiji. April 1952.
27. **A Survey of Leprosy in the British Solomon Islands Protectorate.** Dr. C. J. Austin. July 1952.
56. **Leprosy in Netherlands New Guinea.** Dr. Norman R. Sloan. April 1954.
57. **Leprosy in the Trust Territory of the Pacific Islands.** Dr. Norman R. Sloan. April 1954.
62. **Leprosy in American Samoa.** Dr. Norman R. Sloan. July 1954.
64. **Dental Conditions in School Children of American Samoa.** Dr. Raymond G. Neubarth. August 1954.
67. **Ophthalmological Survey of the Trust Territory.** Dr. H. E. Crawford. September 1954.
69. **Leprosy in Western Samoa and the Cook Islands.** Dr. Norman R. Sloan. October, 1954.
96. **Health Education In The South Pacific.** G. Loison and L. L. Keyes. September 1956.

MOSQUITO-BORNE DISEASES

17. **Conference of Experts on Filariasis and Elephantiasis, Tahiti: Summary of Proceedings.** September 1951.
33. **A Survey of Malaria in the British Solomon Islands Protectorate.** Dr. R. H. Black, School of Public Health and Tropical Medicine, University of Sydney. November 1952.
60. **Some Aspects of Malaria in the New Hebrides.** Dr. R. H. Black. May 1954.
61. **Malaria in the Trobriand Islands.** Dr. R. H. Black. May 1954.
65. **Annotated Bibliography of Filariasis and Elephantiasis.** September 1954. (5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)
66. **Distribution of Filariasis in the South Pacific Region.** Dr. M. O. T. Iyengar. September 1954. (5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)
68. **Malaria in the Torres Straits Islands.** M. Josephine Mackerras and Dorothea F. Sandars. October 1954.
80. **Malaria Control and Research in Netherlands New Guinea.** Dr. R. H. Black. March 1955.
81. **Malaria in the South-West Pacific.** Dr. R. H. Black. March 1955.
86. **Distribution of Mosquitoes in the South Pacific Region.** Dr. M. O. T. Iyengar. 1955. (8/- stg., 10/-A., 9/-F., $1.20, 4G.)
88. **Annotated Bibliography of Filariasis and Elephantiasis. Part 2.** Dr. M. O. T. Iyengar. Jan. 1956. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
104. **Developmental Stages Of Filariae In Mosquitoes.** Dr. M. O. T. Iyengar. May 1957.
105. **An Investigation On Filariasis In The Berau Region.** H. de Rook. May 1957.
109. **Annotated Bibliography of Filariasis and Elephantiasis. Part 3.** Dr. M. O. T. Iyengar. July 1957. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
110. **Enquete epidemiologique et entomologique sur la Filariose de Bancroft en Nouvelle-Caledonie et dependances.** M. Lacour et J. Rageau. (With Summary in English). August 1957.
117. **La repartition geographique des moustiques en Nouvelle-Caledonie et dependances.** J. Rageau. Mars 1958. (Available in French only).
119. **Enquete entomologique sur le Paludisme aux Nouvelles-Hebrides.** Jean Rageau et Guy Vervent. Janvier 1959. Available in French only. (25 francs CFP.)
124. **Annotated Bibliography of Filariasis and Elephantiasis.** Part 4. Treatment. Dr. M. O. T. Iyengar. August 1959. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
125. **Studies On The Epidemiology Of Filariasis On Central And South Pacific Islands.** Elon E. Byrd and Lyle S. St. Amant. September 1959. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
126. **A Review of the Literature on the Distribution and Epidemiology of Filariasis in the South Pacific Region.** M. O. T. Iyengar. October 1959. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)

TROPICAL CROPS

31. **Cocoa Plantation Management in Western Samoa.** D. R. A. Eden, General Manager, New Zealand Reparation Estates, and W. L. Edwards, Assistant General Manager. October 1952.
36. **Cocoa Growing in Fiji Islands.** D. H. Urquhart, former Director of Agriculture, Gold Coast. December 1952.
37. **Cocoa Growing in Netherlands New Guinea.** D. H. Urquhart. January 1953.
38. **Coffee Growing in New Caledonia.** D. H. Urquhart. January 1953.
39. **Cocoa Growing in Western Samoa.** D. H. Urquhart. January 1953.
40. **Cocoa Growing in New Hebrides.** D. H. Urquhart. January 1953.
48. **The Management of Coconut Plantations in Western Samoa.** D. R. A. Eden. September 1953.
82. **The Manufacture of Copra in the Pacific Islands.** W. V. D. Pieris. July 1955. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
94. **Food Plants of the South Sea Islands.** Dr. E. Massal and Jacques Barrau. September 1956. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
97. **Rice Production In The South Pacific Region.** R. Watson. October 1956.

PESTS AND DISEASES OF PLANTS AND ANIMALS

9. **Report of Plant and Animal Quarantine Conference, Suva.** April 1951.
34. **Rhinoceros Beetle Control in the Kingdom of Tonga.** L. J. Dumbleton, Plant and Animal Quarantine Officer, South Pacific Commission. November 1952.
77. **A List of Diseases and Parasites of Animals Recorded in the South Pacific Territories.** Bilingual. December 1954.
78. **A List of Plant Diseases Recorded in South Pacific Territories.** Bilingual. December 1954.
79. **A List of Insect Pests Recorded in South Pacific Territories.** Bilingual. August 1955. (6/- stg., 7/6A., 6/9F., $0.90, 3G.)
101. **Parasites And Predators Introduced Into The Pacific Islands For The Biological Control Of Insects And Other Pests.** L. J. Dumbleton. March 1957.
107. **The Rhinoceros Beetle In Western Samoa.** R. A. Cumber. June 1957. (4/- stg., 5/-A., 4/6F., $0.60, 2G.)

ECONOMIC CONDITIONS

54. **The Pacific Islander and Modern Commerce.** V. D. Stace, Assistant Economist, Reserve Bank of New Zealand. March 1954.
89. **Small-Scale Industry for the South Pacific—Preliminary Papers.** Cyril S. Belshaw. March 1956. (4/- stg., 5/-A., 4/6F., $0.60, 2G.)
90. **Industrial Activity in Selected Areas of the South Pacific.** K. H. Danks. March 1956. (5/- stg., 6/3A., 5/6F., $0.75, 2.50G.)
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